DOCTORAL THESIS

Governing Non-Personal Smart City Data as a Commons and the EU Legal Framework – An Inevitable Conflict?

Aleksi Oskar Johannes Kajander

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TALLINN UNIVERSITY OF TECHNOLOGY
School of Business and Governance
Department of Law
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Supervisor: Tenured Associate Professor Dr. Thomas Hoffmann
School of Business and Governance
Department of Law
Tallinn University of Technology
Tallinn, Estonia

Co-supervisor: Senior Lecturer Dr. Agnes Kasper
School of Business and Governance
Department of Law
Tallinn University of Technology
Tallinn, Estonia

Opponents: Prof. Dr. Azar Aliyev, LL.M
Faculty of Law, Economics, and Business
Department of Law
Martin-Luther-Universität Halle-Wittenberg
Halle an der Saale, Germany

Prof. Dan Svantesson
Faculty of Law
Centre for Space, Cyberspace & Data Law
Bond University
Robina, Australia

Defence of the thesis: 02/09/2025, Tallinn

Declaration:
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

Aleksi Oskar Johannes Kajander

signature

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Targa linna andmete kui ühisomandi haldamine ja ELi õigusraamistik – vältimatu konflikt?

ALEKSI OSKAR JOHANNES KAJANDER

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The author of this thesis contributed to the publications constituting to this thesis as follows:

I. Sole author of this Publication.
II. The author of this thesis was the lead author and was responsible for producing the first draft of the paper.
III. The author of this thesis was the lead author and was responsible for producing the first draft of the paper.

Abbreviations

CJEU	Court of Justice of the European Union
CPR	Common-pool Resource
DGA	Data Governance Act
ECJ	European Court of Justice
EFD	Essential Facilities Doctrine
EU MS	European Union Member State
GC	General Court (EU)
GDPR	General Data Protection Regulation
GKC	Governing the Knowledge Commons
IPR	Intellectual Property Rights
NSCDC	Non-Personal Smart City Data Commons
TFEU	Treaty on the Functioning of the European Union

Terminology

Anti-commons	Underuse of a knowledge resource due to restrictions, such as from intellectual property rights (Ostrom & Hess, 2007, p. 349)
Commons	A form of community governance of a shared resource (Madison, Frischmann, Strandburg, 2019, p. 2)
Common-Pool Resource	A natural or man-made resource system that is sufficiently large to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits of using it (Ostrom, 1990, p. 30)
Data	An unprocessed collection of values (Ostrom & Hess, 2007, p. 8)
Dynamic Data	Any content in a digital form that is subject to real-time updates, which includes data generated by sensors (Open Data Directive, Article 2(8)). In this thesis, it equates to meaning just sensor data
Information	Organized data (Ostrom & Hess, 2007, p. 8)
Knowledge	Assimilation of information (Ostrom & Hess, 2007, p. 8)
Non-Personal Data	Data not relating to any identified or identifiable person
Personal Data	Data relating to an identified or identifiable natural person (GDPR Article 4 (1))
Resource	Any useful or valuable possession (Cambridge Dictionary)
Smart Citizen	A natural person who lives in a smart city
Smart City	A city that utilizes information communication technologies in the form of a sensor network for various purposes, such as to improve efficiency and economic benefits, through rapid collection and sharing of data (Moura, Abreu e Silva, 2021, p. 1)
Smart City Data	Any data derived from the sensor network of a smart city

1 Introduction

1.1 Smart City data and Smart Citizens

1.1.1 The Problem within EU Smart Cities

"*Our technological powers increase, but the side effects and potential hazards also escalate"* – Alvin Toffler, Future Shock (1970)

Smart cities are heralded as delivering benefits to efficiency, the environment, and economy, however, the individual smart citizens who will inhabit these cities of tomorrow are often left out of this equation. These benefits are largely derived from the vast amount of data generated through the sensor network that constitutes a smart city. Indeed, it has been said that data is the oil of the 21st century (Beckwith *et al*), which would make Smart Cities the oil wells of the future. Whilst natural oil is the result of plant and animal material masses decomposing, oil of the 21st century in smart cities is the result of composing and collating sensor-recordable movements of the masses within them. It is, therefore, perplexing that the masses generating the oil well's contents are often an afterthought when it comes to deciding how that resource should be used and shared.

The current dichotomy for data within the EU framework is twofold. An individual has rights regarding personal data under the General Data Protection Regulation (GDPR). Under GDPR, personal data amounts to any data that relates to an identified or identifiable natural person (GDPR, Article 4 (1)). As a corollary, non-personal data is any data that does not relate to an identified or identifiable person. And by way of contrast, non-personal data beyond the EU Open Data Directive and the rather coarse measures within the EU strategy for data is largely unregulated. The logical underpinning behind this dichotomy is that personal data, by its very definition, could have an impact on an individual's life, whereas non-personal data could not, as it does not pertain to that individual. However, this dichotomy has been criticised in literature as simplistic, because non-personal data can reveal information about communities and have an impact on them, just as personal data can (Taylor, 2019).

Smart cities embody this potential of non-personal data to affect communities. A smart city may reductively and simplistically be defined as a city that utilizes information communication technology in the form of a sensor network for various purposes such as improving efficiency and economic benefits through rapid collection and sharing of data (Moura, Abreu e Silva, 2021)[1]. For this thesis, smart city data should be considered as data recorded by the sensory network of a smart city. Furthermore, the combined term non-personal smart city data, therefore, refers to data recorded by the sensory network of a smart city that does not relate to an identified or identifiable natural person. For example, the data from a sensor that records the number of cars passing it would exemplify non-personal smart city data, as it does not relate directly to any particular vehicle, and therefore it does not relate to an identifiable individual.

The data generated in real-time by sensors within a smart city will deliver not only appreciable commercial value and worth, but will potentially also have a considerable

[1] For this thesis, it will suffice to consider it in this reductive form, as a city that utilizes ICT technology to capture data through a sensor network. Numerous other definitions for a smart city exist (See e.g., I Publication, p. 10, Ramaprasad, Sanchez-Ortiz, Syn, 2017)

impact on the lives of individuals in a city, depending on how that data is shared. This effect will be a combination of the multitude of data parameters, the volume, and real-time availability, which are able to produce noticeable changes in the lived environment of inhabitants. Consider, for example, the case of Waze, which in effect provided real-time routing of traffic based on user reports of traffic jams (**I Publication**). Providing alternative routes to avoid traffic jams improved traffic efficiency. However, it also resulted in previously quiet communities, ill-equipped to handle large traffic flows, suddenly being subjected to a massive influx of traffic. This, in turn, gave rise to community concerns for the safety of inhabitants, as well as other complaints such as increased noise levels. A network of sensors in a smart city sharing its data in real-time would have the same effect, as it could enable similar routing optimizations. Consequently, a social dilemma is created, which pits the safety and comfort of a neighbourhood's residents against traffic efficiency, due to the sharing of real-time smart city data.

In the EU, individuals living in a smart city ("smart citizens") are essentially powerless to stop data from their neighbourhoods being shared in real-time. Under the Open-Data Directive, 'dynamic data'[2], which specifically includes data generated by sensors (Open Data Directive, Article 2 (8)), must be made available immediately after collection under Article 5 (5). The economic priority of this obligation is made abundantly clear in Recital 31, which refers to the 'economic value' that is dependent on the 'immediate availability' of this dynamic data. This poses the idea that restricting the availability of this data in any way is in direct conflict with the Open Data Directive. Moreover, as this is an EU-level obligation, domestic law cannot be used to escape this direct obligation to make sensory data available. Thus, smart citizens of any future EU smart city will seemingly need to live in an environment where they have no power to stop the various types of sensor data that they create from being shared in real-time.

The combined effect of applying the GDPR and the Open Data Directive means that non-personal dynamic data must be shared automatically. Crucially, this shared non-personal data might still significantly affect communities and individuals in them. This results in the central imbalance that this thesis focuses on: a citizen within an EU smart city is fundamentally powerless to have a say in how non-personal data they generate every day, through the network of sensors that physically surrounds them, is shared.

1.1.2 Route to The Commons

However, the Open Data Directive extends only to public sector bodies. Although in this case, the obvious answer would appear to be that if smart city data were to be held by a non-public entity, it would be free to decide how to share its dynamic data. Perhaps the most apparent solution could therefore be to privatize ownership of smart city sensors and data. This is not difficult to envision, as private companies have often already provided the infrastructure for a smart city, however, they do so in exchange for data, which is then used according to their business interests (Morozov, 2018). Aligning these business interests with those of the local community would be a complicated equation, and would undoubtedly result in a middleman in the form of a profit-oriented

[2] The term 'dynamic data' refers to any content in a digital form that is subject to real-time updates, which includes data generated by sensors (Open Data Directive Article 2(8)). For the purposes of this thesis, this definition is further simplified to mean only sensor data, whereby dynamic data is to be understood as sensor data.

private company. Consequently, the smart citizen would likewise still be left out of the decision-making process, even if such smart city sensors were privately owned. Therefore, another solution is arguably needed, which lies outside the private-public dichotomy, and that is to say, cutting out (all) middlemen, by establishing self-governance by the smart citizens themselves.

Smart city visions have often been 'corporate-led', focussing on economic aspects that reduce smart citizens to the role of consumers (Knieps, 2017), and therefore they do not receive meaningful citizen power. This 'neoliberal' or corporate-led approach to a smart city inherently disempowers individual smart citizens, by at best granting them largely tokenistic possibilities to enact change (Cardullo and Kitchin, 2019a). This may be framed within Arnstein's concept of the 'ladder of citizen participation' (Arnstein, 1969) that was subsequently adapted to fit the smart city environment by Cardullo and Kitchin (2019b) under their 'Scaffold of Smart Citizen Participation'. Whilst Arnstein's older definition of 'tokenistic' citizen power, which may be summarized as providing a voice and perceived authority that is, in reality, an 'empty ritual' (Arnstein, 1969, p.216), is not too far from the truth, Cardullo and Kitchin's update is far more specific for the smart city context.

Under the updated scaffold, a ninth rung is added between the categories of 'tokenism' and 'non-participation', called 'consumerism' (Cardullo and Kitchin, 2019b). Under consumerism, the smart citizen, in essence, is restricted to interacting with the smart city as a consumer, and their main 'choice' is which service to buy (Cardullo and Kitchin, 2019b). Moreover, as a secondary role, the smart citizen is, in effect, a 'data product' that produces valuable data from which corporations can extract value and worth (Cardullo and Kitchin, 2019b). In other words, the smart citizen is essentially a voiceless consumer, but also serves as a source of valuable data.

This type of corporate-led consumerist vision is evident in the European Union Strategy for Data, which primarily concerns ensuring benefits to businesses and the economy, through sharing across the EU (European Commission, 2020, pp. 4–5). While the individual retains a degree of control over their own personal data, even this is largely limited to the decision of who to sell it to (ibid, p. 10), which fits the consumerist 'choice' under Cardullo and Kitchin's Scaffold of Smart Citizen Participation. Furthermore, when the European Strategy for Data is viewed through the lens of this scaffold, the intention of extracting maximum value from smart citizens as 'data products' becomes evident. For, when the empowerment of individuals is discussed, it is framed in terms of the 'personal data economy' (European Strategy for Data, 2020, p. 10), that is to say, the maximum extraction of all possible valuable data from an individual. Non-personal data is not even mentioned concerning the individual, as it is presumed it will be shared under the aforementioned Open Data Directive, and the potential harm this may deliver to individuals or groups of individuals is not addressed, as the overarching focus is on economic benefits. In other words, it would appear the overarching corporate-led vision for the digital single market in the EU restricts individuals mainly to the role of a consumer, when it comes to non-personal smart city data.

Elinor Ostrom provided a means of empowering local communities in her Nobel Prize-winning work on common-pool resources (CPR) and the commons (Ostrom, 1990). Her work focussed on studying long-lived and established means of self-governance of a depletable common resource by various local communities (ibid). The resulting commons represent a third option to the public-private divide, which arguably represents an attractive alternative in the case of managing non-personal smart city data. Incorporating principles that have made those commons sustainable over the centuries (ibid), represents

not only a potential, but a viable way forward to re-empower and so confirm disenfranchised smart citizens.

Naturally, Ostrom's commons cannot simply be applied 'as is' to non-personal smart city data, as several key differences must be considered. Firstly, unlike the original commons examined, digital data does not deplete in the same way as fishing grounds, for example. Secondly, final outcomes and impacts of mismanagement are entirely different, which for traditional commons is the resource becoming extinct, whereas for data, it would be suboptimal utilization or sharing of data. Thirdly, the original commons studied were generally in rural areas with relatively small communities, whereby the resulting commons structures were not formally recognized from a legal point of view, in a manner one would expect to find in large cities. Consequently, this theory must clearly be adapted before it can be applied to the context of non-personal smart city data.

Ostrom herself acted to extend her initial theory to data and knowledge in her work with Hess on knowledge commons. The threat under the knowledge commons paradigm was not overconsumption, but rather the 'anti-commons', where data was not shared adequately due to various restrictions, such as intellectual property rights (IPRs), which resulted in negative outcomes, such as difficulties with scientific research (Ostrom & Hess, 2007). As a basic premise, this applies somewhat to non-personal smart data, as data not being shared threatens not only scientific research, but economic interests and efficient governance of smart cities. However, in the case of non-personal smart city data, the anti-commons would not result from IPR restrictions, but rather from the commons themselves, restricting the availability and sharing of data. Therefore, it remains debatable whether data truly fits the description of a 'common-pool resource', especially in light of Ostrom's theory.

Nevertheless, as outlined above, in the case of non-personal smart city data, the need for collective governance of non-personal smart city data is derived both from the legislation (Open Data Directive and GDPR), and from the corporate-led focus surrounding smart cities. Non-personal smart city data does not deplete, nor does it degrade through sharing with other parties, however, sharing it may have undesirable effects on those who generated the data. As such, applying the updated Governing the Knowledge Commons (GKC) model (Madison, Frischmann, and Strandburg, 2019) in the context of this thesis is more appropriate, as fundamentally the purpose of this thesis is to establish whether collective governance of non-personal smart city data is possible in the EU legal framework. This is due to the GKC considerably simplifying the nature of the model, as it flips Ostrom's original approach, where a resource's characteristics determine the most appropriate governance model. Under GKC, collective governance makes a resource into a commons, and institutions (s) are the ones determining the characteristics of the resource (Purtova, van Maanen, 2024, p. 23).

This is appropriate in the present context, where the resource, a valuable or useful possession, is distinct from both traditional common-pool resources and the knowledge commons. Non-personal smart city data is not a natural depletable resource or good, such as a fishing ground, that would constitute a traditional CPR. Moreover, non-personal smart city data is infinitely shareable as a resource, generated automatically without human intervention from sensors that constitute a smart city. Therefore, it is not a product created by the human intellect and is not entitled to traditional intellectual property protection such as a copyright or trademark(s) (World Intellectual Property Organization, 2020). Instead, in the context of smart cities, the need for collective

governance of the resource derives from the need to balance harm to the community resulting from sharing the resource too openly against the economic and scientific harm resulting from insufficient sharing. Hence, it corresponds to the use case of the GKC framework, which applies to instances where shared data warrants collective governance (Madison, 2024). Collective governance there, in the context of this thesis, refers to governance of non-personal smart city data by the local community in which it is generated.

In the context of this thesis, a commons should therefore be understood merely as a form of community governance of a shared resource (Madison, Frischmann, Strandburg, 2019), in this case, non-personal smart city data. Consequently, as the need for collective action is established for non-personal smart city data through legislation and corporate-led approaches of smart city projects and the EU Strategy for Data, it becomes evident that the GKC is the optimal approach for this thesis. As a result, this thesis does not aim to offer an in-depth critique or suggestions as to which principles the commons should use to govern itself, but rather the main focus is on whether collective governance as a commons would be possible at all from a legal perspective. Hence, the ultimate aim of this thesis is to determine whether a commons could be used to govern non-personal smart city data under the EU legal framework.

1.2 Research Questions

The primary purpose of this thesis is to elucidate whether implementing self-governance through commons for non-personal smart city data is possible under the current EU legal framework. The cause of the problem regarding non-personal smart city data stems from EU law, and therefore, no solution at the level of national law could address the issue of public institutions being required to make 'dynamic data' available immediately, regardless of the consequences this may have for local citizens. However, if 'dynamic data' produced by the sensors of a smart city is no longer held by public sector bodies, and is instead governed by the local community through commons, this issue is solved *prima facie*. However, such commons are not incorporated or acknowledged in the current EU legal framework, and considering their potential impact on implementation of the 'digital single market' by restricting the flow of non-personal data, which is a key constituent part of the concept, the potential for conflict with the rest of the EU legal framework becomes evident.

Therefore, to explore these conflicts, the main research question for this thesis focusses on the EU framework, to elucidate these conflicts and identify possible solutions. Domestic law is not considered, as the scope would become unmanageable if it became necessary to examine the individual national laws of all Member States. Therefore, the main research question guiding the thesis is derived as follows:

To what extent is the European Union Legal Framework compatible with the governance of non-personal smart city data through commons?

In order to achieve a practical resolution to the research question, it is necessary to link it to three sub-questions, each of which provides a key contribution to resolving the overarching research question. Each of the three sub-questions is addressed, although not necessarily exhaustively, by a publication that makes up this thesis. Combined, the answers to the sub-questions in turn provide an answer to the main research question.

The conflict lying at the heart of this thesis is the lack of socially sustainable data governance principles, as economic factors are prioritized over individuals and their needs (Knieps, 2017, p. 116)**.** In this case, the ability to meaningfully participate in the decision-making on governance of data, which is not personal data. As the data parameters and amount of data increase in a context, such as that of a smart city, the intensity of this issue will increase, which, if left unaddressed, will threaten the long-term social sustainability of any such system. This, in turn, could be solved by incorporating commons that would empower the local community to look after their own interests.

However, it is unclear whether the EU legal framework would allow for such decision-making. In this regard, the first step is to establish the state of the literature on smart city data commons and what legal issues, if any, have already been identified. As such, it addresses the overall research question by identifying the potential sources of conflicts in existing European Union laws (*lex lata*). Therefore, the focus and purpose of the first publication is to provide a baseline for the following specialized publications on legal issues identified. Consequently, the first sub-question that is utilized in the first publication is constituted as follows:

I. Which parts of the existing EU legal framework may potentially conflict with the governance of non-personal smart city data as a commons?

Following the research findings of the first publication, the second publication delves into the looming conflict with competition law that was identified. The conflict was of particular significance, as it threatens the very core of meaningful governance of non-personal smart city data, because EU competition law could prohibit a commons from deciding not to share data under certain circumstances. Therefore, this conflict has the potential to strip away the most meaningful power of a commons, the ability of the commons to manage the resource as they wish. Consequently, this potentially significant incompatibility with the EU legal framework is explored through the second sub-question, which is constructed as:

II. Is EU competition law compatible with collective governance of non-personal smart city data through a commons?

The final publication of the thesis explores the possibility of concretely implementing a smart city data commons within the existing legal structure of the EU. This addresses the need for a formally recognized structure that is legally sound for a smart city data commons, as identified in the first publication. As it would be impossible for a smart city data commons to function if it did not have a legal form enabling it to possess the powers necessary for self-governance of smart city data by the local community. These powers, in particular, include the capacity to assume ownership or stewardship of non-personal data, enter into legal transactions, and the authority to decide upon releasing data. Therefore, the third and final sub-question is synthesized as:

III. Does the Data Governance Act enable formal recognition of non-personal smart city data commons in the EU legal framework?

Therefore, combining the three sub-questions will provide an answer to the overall research question. For the first publication identifies the potential legal conflicts, whilst the following two provide in-depth analysis of the most significant legal issues identified, and so together these provide a comprehensive answer to the main research question.

1.3 Methodology and Research Strategy

To answer the overall research question, the EU legal framework must be examined from the perspective of a commons that manages non-personal smart city data. The commons research framework (Madison, Frischmann, and Strandburg, 2019) was used to determine key aspects of such a commons. Once these key aspects have been determined, it is possible to subsequently isolate potential legal conflicts. Therefore, the research strategy utilized in the thesis was essentially a two-stage one, the first stage being examining existing literature and identifying legal conflicts, based on the non-personal smart city data commons (NSCDC). The first publication covered first-stage objectives. The second stage followed up on legal conflicts identified in the first stage, confronting an NSCDC, which would be examined in the second and third publications.

In order to construe the basic aspects and functioning of the NSCDC, the GKC commons research framework by Madison, Frischmann, and Strandburg (2019) was used. The full framework could not be utilized as the commons does not yet exist, and therefore it cannot possess, for example, a history or informal norms that could be studied. Moreover, considering the focus of this thesis is merely on its viability in the eyes of the EU legal framework, a full examination of the internal workings of such a commons was not warranted, such as how decision-makers are selected within the commons. That is not to say that the findings would be entirely irrelevant to the internal workings of an NSCDC, only that they would be tied intensely to the findings on the external demands from the EU's legal framework on the commons. For example, the need to comply with competition law implies the need for legal expertise within the commons to ensure data sharing decisions are lawful, which may be met through incorporating a lawyer into the decision-making structure internally or having a procedure for external legal consultations. Therefore, the primary focus remained on the external capabilities, such as having legal capacity and being able to possess or embody stewardship over non-personal data, as well as the ability to meaningfully restrict sharing of non-personal smart city data. As a result, the original commons research framework was shortened and simplified for this purpose, and is displayed below in Table 1.

Table 1: *The Simplified Commons Research Framework (adapted from Madison, Frischmann, and Strandburg, 2019).*

Background Environment	What is the background context (legal, cultural, etc.) of this commons?
	What is the "default" status, in that background context, of the sorts of resources involved in the commons (patented, copyrighted, open, or other)?
Resources	What resources are pooled, and how are these created or obtained?
	What are the characteristics of the resources? Are they rival or nonrival, tangible or intangible? Is there a shared infrastructure?
Community Members	Who are the community members, and what are their roles?
	What is the degree and nature of openness, regarding each type of community member and the general public?
Goals and Objectives	What are the goals and objectives of the commons and its members, including obstacles or dilemmas that must be overcome?
Governance	What are the relevant action arenas and how do they relate to the goals and objectives of the commons and relationships between various types of participants, and with the general public?
	What are the governance mechanisms (such as a conflict resolution mechanism)?
	What legal structures apply (e.g., intellectual property, subsidies, contracts, licensing, tax, and antitrust)?
Patterns and Outcomes	What benefits are delivered to members and to others (e.g., innovations and creative output, production, sharing, and dissemination to a broader audience, and social interactions that emerge from the commons)?
	What costs and risks are associated with the commons, including any negative externalities?

These questions bore primary relevance in answering the first of the sub-questions, where potential legal conflicts were identified on the basis of the NSCDC. Utilizing the above research framework ensured the commons was construed with due consideration for relevant aspects that would be examined in the case of a real commons. Moreover, existing case studies of commons that involved data sharing were utilized and analysed with a view to identify legal conflicts, such as the sharing of flood plain data and its impacts on the local community (Beckwith, Sherry, Prendergast, 2019). The combination of existing case studies and the utilization of the GKC framework created NSCDC served to maximize the number of legal conflicts that could be identified during the research.

Furthermore, considering the nature of the research topic, the thesis is not purely legal. Rather, it looks at existing law, *lex lata*, through a commons constructed with the GKC framework. For the intention is to critically evaluate the law, and aim to identify conflicts and obstacles to a commons functioning for non-personal smart city data. As such, GKC's guiding questions for a commons (Madison, Frischmann, and Strandburg, 2019) are also used as a lens through which the law is evaluated. Moreover, other economic viewpoints will similarly be used to evaluate the law, such as the concept of information as a collective good, with a view to maximizing (social) welfare (Pacces and Visscher, 2012).

However, as it turned out, literature discussing commons that fit exactly into this niche of governing non-personal data within a smart city in the EU was rather limited, as will be discussed in the section on findings below. Especially concerning legal aspects and legal conflicts, this was scarcely addressed at all, barring a few passing mentions. Consequently, this thesis provides what appears to be one of the first examinations of practical legal challenges such as commons governance would face, if implemented in this smart city context.

As a result, the individual methodology of the first publication reflects the need to establish the *status quo* in a field with limited research, specifically on legal aspects of the commons, through utilizing Webster and Watson's (2002) literature review method. This method, in essence, compensates for the lack of available literature through additions to the field, with the author's contributions (Webster and Watson, 2002, p. 2). This contribution is the identification of legal issues from literature on smart city data commons. Moreover, the three-step Webster and Watson method has previously been utilized in the smart city context (Pereira *et al*, 2018, p. 145).

Consequently, the first step of the research was to conduct a search in Scopus and Web of Science using the keywords "smart city" (alternatively "smart cities"), "commons" and "data", with all three being required in either the title, abstract, or keywords, to allow a result to qualify. The Web of Science and Scopus databases were selected for their high-quality citation data (See Zheng *et al*, 2020, p. 6, Lim *et al*, 2019, p. 2). Moreover, this had the added benefit of being consistent with the Estonian Research Information System's highest classification, 1.1. for articles in journals. Subsequently, keywords of qualifying results were utilized to snowball the number of results. As a result, three additional keywords, "knowledge commons", "urban commons", and "data commons" were combined with "smart city" and "smart cities" to produce additional results. The ultimate result of this process was merely 19 qualifying articles, whereby the need to introduce the author's contribution according to Webster and Watson's method became not only appropriate, but necessary. Thus, the first publication effectively serves as the (main) literature review for overall research, even if subsequent publications individually utilized literature reviews as part of the 'ordinary' doctrinal legal research sense (see Hutchinson and Duncan, 2012, pp. 112–113).

In the overall scheme of this research, the second and third publications effectively serve as specialized follow-ups to issues identified in the first publication. To contextualize them with the GKC commons research framework, in effect, they answer the questions on the legal background and legal structures that apply to the commons. As they are essentially legal papers, they too utilized doctrinal research as is normal in legal research (Chynoweth, 2008, p. 31). The second and third publications followed the problem-based doctrinal approach as outlined by Hutchinson and Duncan (2012). This method is a

two-step process that consists primarily of identifying the sources of the law and then subsequently analysing the sources identified (Hutchinson and Duncan, 2012). This process can be described as a seven-step process (Hutchinson and Duncan, 2012):

1. Assembling relevant facts
2. Identifying legal issues
3. Analysing these issues with a view to identifying the relevant law
4. Reading the background material (including journal articles)
5. Locating primary material, such as legislation and case studies
6. Synthesizing all the issues in context
7. Reaching a conclusion

The first publication, in effect, provides the first two steps for both subsequent publications, as it establishes relevant facts of the NSCDC, and the legal issues with most pressing significance. The above method, although used by lawyers since the early 19th century, is notably limited by the availability of reliable data (Kharel, 2018). However, in the case of the second and third publications, this limitation or restriction was somewhat mitigated by the topics of those publications. For the second publication, as it deals with EU level competition law, there is a fairly limited pool of case law dealing with data-related issues, significantly reducing the chance of important cases being missed. Moreover, there is a significant volume of literature focussing on the role of digital data, albeit usually from an intellectual property perspective, whereby relevant case law from the European Court of Justice (ECJ) is relatively clear and readily evident. Hence, for the second publication, the issue was not so much finding relevant case law as it was approaching it from the rather novel non-personal data perspective, which is relatively obscure, barring database-related issues. By contrast, the amount of case law and academic articles for the Data Governance Act (DGA), was rather limited because, at the time of writing (2023), the DGA had only recently been introduced (23 June 2022), and only became applicable in September 2023. Thus, there was no large body of caselaw or academic journals on hand, as neither had had a chance to develop by then.

Consequently, this common methodology was used in the publications to solve the legal issues that were identified. Naturally, both publications additionally used document analysis to examine primary and secondary sources relevant to the question at hand. For example, the second publication utilizes both primary EU competition law in the form of the Treaty on the Functioning of the European Union (TFEU) and case law examined using the document analysis method. This was complemented by using secondary sources in the form of academic articles, although owing to the novelty and niche field of the research, often secondary sources specific to the legal issues about smart city data commons were not available, as noted above, concerning the intellectual property focus of data often found in competition law. Similarly, the secondary sources utilized were often analogous, such use of articles on 'green competition law' that could be applied by analogy to commons to potentially justify an exceptional approach to EU competition law. Therefore, the second publication addressed the potentially existential conflict with competition law, derived directly from the first publication. By way of contrast, the third publication depended far more heavily on the primary legal act, the DGA, owing to its novelty at the time.

In conclusion, the first publication identified the legal issues, which the second and third publications then subsequently addressed, utilizing the problem-based doctrinal approach. Finally, this work serves as the unifier, under which findings of the three publications are collated to provide an answer to the overall research question. Through compiling the findings, it becomes possible to deliver an answer encompassing potential conflicts and legal issues identified in the EU legal framework.

2 Findings

2.1 Identifying Potential Conflicts with the EU Legal Framework

The first publication in many ways provided a baseline for the overall research, owing to its literature review on the smart city and commons, as well as subsequent analysis on identifying emerging legal issues from therein. In terms of the GKC's commons research framework, the first sub-question identifies the background environment, resources, community members, goals, and objectives (Madison, Frischmann, and Strandburg, 2019, p. 15) of an NSCDC in the EU. The relevant legal structures and conflicts were identified through responses to the GKC questions, which then led to the second and third sub-questions. The second and third sub-questions, in turn, focus solely on the question of which legal structures (ibid) apply, based on the conflicts identified.

2.1.1 Background Context and Default Status of Data

As per the GKC commons research framework, the first questions that must be elucidated are, what is the background context of the commons, as well as the default status of the resource in question? Ideally, this background context could be established concerning an existing NSCDC, however, as demonstrated by the literature review in the first publication, none were identified. Consequently, it became necessary to establish the background context, such as it is, for an NSCDC.

In the case of non-personal smart city data, the relevant legal background context is primarily existing EU legislation and the concerns already identifiable in it, which relate to non-personal data. This relevant legal background derives mainly from the interplay of Open Data Directive's Article 5 and the General Data Protection Regulation. Article 5 of the Open Data Directive stipulates that all 'dynamic data' held by public institutions must be made available immediately. In line with Recital 16 of the Open Data Directive, this data must be made available for all purposes, commercial or private, and for anyone.

This in turn provides two relevant pieces of the background, the type of data that this thesis focuses on, 'dynamic data', in addition to a legal obligation to make such data available 'immediately after collection', regardless of the consequences this may have for the local residents. The corporate underpinnings associated with this obligation are evident in Recital 31, where swift, quick and rapid release of dynamic data is specifically highlighted as it is crucial, because the 'economic value of which depends on the immediate availability of the information', that in turn will lead to 'creation of new aggregated information products and services'. Clearly, the priority is purely economic. Furthermore, as the legal obligation is mandatory, as evidenced by the word 'shall' in Article 5 (5), it warrants compliance from national public sector bodies.

Furthermore, the opportunities to attempt to limit the distribution of 'dynamic data' in particular are extremely limited. Firstly, this is in direct contravention of the proposed policy of 'open by design and by default' found in Article 5 (2) of the Open Data Directive. Secondly, as noted, the emphasis of the overall EU Strategy for Data and the Open Data Directive is clearly for maximum mobility of data, especially dynamic data immediately after collection. It therefore becomes evident to us that any restrictions would need to be balanced against the overarching EU goal of a digital single market and pooling of data into Common European Data Spaces. Moreover, as per ECJ case law, the most unifying feature of such defences based on legitimate public interest that might be applied in this case is their rejection (**II Publication**, p. 8). Therefore, any restriction or limitation would need to be based on serious safety considerations, rather than community preferences,

which do not necessarily relate to matters of life or limb. In addition, the Open Data Directive makes no provision for actually refusing to render dynamic data unavailable; rather more it only discusses the possible need for verification and then release of data in a timely manner, in Recital 31. Consequently, it is extremely unlikely that any meaningful restrictions can be assigned to dynamic data that is non-personal and was generated from a smart city's sensors. As a result, it becomes apparent that as long as dynamic data is held by public sector bodies, it is not possible to reflect community interests beyond serious considerations of national security or serious safety considerations.

The non-personal data that this thesis focusses on is, as mentioned in the introduction, defined as data recorded by the sensor network of a smart city that is not related to an identifiable or identified natural person. This definition would transpose such data into the scope of the definition of 'dynamic data' in Article 2 (8) of the Open Data Directive, which explicitly includes 'data generated by sensors'. The justification for excluding data that would relate to identified or identifiable persons is that it would otherwise become personal data that would be protected under the GDPR, and a natural person would possess rights regarding it. This, in effect, leaves local communities no meaningful opportunity to influence how this data is shared, despite it relating to their surroundings and having an impact on them (**III Publication**, p. 14).

Therefore, in effect, the answer to the default status of the resource as per the GKC commons research framework has been identified. The default status of non-personal smart city data under the current EU legal framework is that it is shared openly with little to no regard for the effects it may have on the district or region, or residents and inhabitants, in which it is generated. This state of affairs is the result of the existing EU legal framework, which both divides data into the categories of personal/non-personal data and warrants sharing the latter if it is derived from smart city sensors as dynamic data.

However, the background context for the commons is not limited purely to the legal aspects. The concern for the role of smart citizen in a smart city became readily evident in the literature reviewed, with a clear majority of the papers expressing such concerns (**I Publication**). As a result, there was an identifiable criticism of the primarily business-led concepts for smart cities (Knieps, 2017, Cardullo and Kitchin, 2019a), which were in dire need of counterbalancing to ensure that citizens' interests are upheld. This corporate-led vision for a smart citizen embodied as its common theme the reduction of a smart citizen essentially to the role of a consumer with little to no actual ability to make meaningful decisions (Cardullo and Kitchin, 2019a).

Furthermore, a type of corporate-led consumerist vision is evident in the European Union's Strategy for Data, which is primarily concerned with ensuring benefits to businesses and the economy through sharing data across the EU (European Commission, 2020, pp. 4–5). As such, it is evident that any NSCDC within the EU would be affected by the strategy. This corporate approach is embedded in the strategy to such an extent that even the degree of control over personal data is largely limited to the decision of who to sell it to (ibid, p. 10), which fits the consumerist 'choice' under Cardullo and Kitchin's Scaffold of Smart Citizen Participation. Viewing the European Strategy for Data through the lens of this scaffold, the focus on extracting maximum economic value from a smart citizen as a 'data product' becomes clear. The extent of empowerment of individuals is limited to the terms of 'personal data economy' (European Strategy for Data, 2020, p. 10), which in effect serves to ensure that all possible valuable data from an individual may be utilized. Non-personal data is not even mentioned concerning the individual,

as it is presumed this is shared under the aforementioned Open Data Directive, and potential harm that this may bring to individuals or groups of individuals is not addressed, as the overarching focus is on economic benefits. This bears considerable relevance for any NSCDC in the EU, as it sets the stage for a conflict. For a commons that meaningfully governs non-personal smart city data represents a threat to open sharing of data, and thereby to economic benefits that would ensue. This, in turn, may have far-reaching implications, as it is unlikely that such commons will receive much in the way of favourable treatment from EU legislators. This implication is particularly resonant when considering the rejection of incentives such as 'green antitrust', which were broadly aligned with non-economic EU priorities (**II Publication**).

Ultimately, the NSCDC was born out of necessity. For, in addition to the above, the social context that surrounds non-personal smart city data must be considered. The case study with the effects of *Waze* is an excellent illustration of this necessity (**I Publication**). *Waze* provides a close analogy for what effects actual sensor data from a smart city may have, if released in real-time. While *Waze* relies on user updates, the effect remains similar, even if data is not updated as quickly and is not as accurate as if it were derived directly from the sensors constituting a smart city. The app made quicker transit through urban areas possible by mapping out areas of congestion and providing alternative routes to reach the destination in a shorter time. This, in turn, translates to more efficient traffic flow and competitive advantages for those businesses, such as taxi drivers, truckers, or other delivery services that are able to use the data to reach their respective destinations quicker.

However, all of this came at a cost to the community. Previously quiet neighbourhoods were suddenly flooded with traffic, which the previously quiet streets were often ill-equipped to handle. This, in turn, sparked concerns over safety, especially for children, for whom the streets became more dangerous, as well as concerns for overall comfort in residential areas due to noise and pollution. As a result, a social dilemma resulted from the release of this non-personal quasi-smart city data, the efficiency of traffic and business interests, opposed to the liveability of residential areas.

In addition, it is worth noting that the downsides facing the community would be replicated even without *Waze* acting as the middleman, and compiling individual user reports of traffic jams in a smart city. In this scenario, any individual could utilize real-time sharing of dynamic traffic data under the Open Data Directive to determine where traffic jams exist in real-time, and so plan their route accordingly. Moreover, people could also look at a compilation of data over a certain time period to establish common traffic patterns and thereby plan their routes. As a result, while a middleman processing raw data into information may make the results available more conveniently, it is worth noting that as long as data is available openly, the same effect can be replicated even if the data is not released in real-time. Therefore, for example, if public sector bodies were to delay releasing dynamic traffic data in an attempt to appease the community, this would be unlikely to provide a comprehensive solution. Moreover, it would, as noted above, run counter to the purpose of the Open Data Directive, the European Strategy for Data, and Common Data Spaces for mobility.

Therefore, if a similar scenario, with a small change, in that data was now delivered from smart city sensors rather than users, occurred in a smart city in the EU, as long as that data would be considered to be held by public sector bodies, there would be no choice, but to continue releasing it, according to the Open Data Directive. Consequently, there is very little that smart citizens can do about this change in their environment,

brought about by releasing smart city data from their surroundings. For, as national law is subject to EU law, the only course of action would be to attempt change on an EU-wide level, which is an absurdly high level for such a local problem. Hence, an NSCDC, if established, would be a solution outside of the private-public paradigm, which is warranted due to the combination of these societal, legal, and corporate-led visions for smart cities.

2.1.2 Non-Personal Smart City Data as a Resource and the Surrounding Community

Proceeding with the GKC commons research framework necessitates examining the resource itself. At its core, the type of non-personal smart city data that this thesis focusses on is produced in real-time and automatically by the network of sensors that constitutes a smart city. As such, it is not a traditional common-pool resource, as it is intangible digital data, nor is it a rival, as it does not degrade if used by multiple users. As the literature demonstrates, this has not prevented the commons framework of governing a resource from being applied to data, information, and knowledge, including by Ostrom herself (Ostrom & Hess, 2007). As Ostrom states, the terms 'data', 'information', and 'knowledge' are not interchangeable. Rather, data is the raw values recorded, and information is the organized form of those values, which can then be analysed to become knowledge (Ostrom 2007). This is relevant for two reasons: firstly, if no data is available, knowledge generation will necessarily suffer, resulting in the 'anti-commons' (Ostrom & Hess, 2007), and secondly, data is a key resource for downstream products and services which have economic value. This latter implication has significant legal ramifications from the competition law perspective, as demonstrated in the second publication. As noted by Purtova and van Maanen (2024, pp. 6–8), there are numerous other ways of describing this relationship between data, information, and knowledge, although broadly speaking, they follow the same pattern, that data is the raw resource that may then be processed further. For purposes of this thesis, this relationship suffices, as what is most pertinent for the subsequent analysis in the second publication is the possibility of economically valuable goods and services existing downstream that require data in order to be produced.

However, for the moment, when considering the specific context of non-personal smart city data, the situation is not as simple, with the 'anti-commons' being the sole negative outcome. Rather, as demonstrated in the first publication, negative social outcomes may arise for the local community inhabiting a smart city whenever non-personal data is shared carelessly. As described in the *Waze* case study, sharing non-personal traffic information is able to disrupt life in various previously quiet neighbourhoods, due to increased traffic from alternative routing suggestions and recommendations (**II Publication,** p. 5). Similarly, concerns were raised, with sharing flood plain data too openly having negative effects on the community as a whole (Beckwith, Sherry, Prendergast, 2019, pp. 216–217). Hence, this thesis argues that there are additional community-related negative outcomes that must be balanced against the threat of the 'anti-commons' in the context of non-personal smart city data.

Nonetheless, there is a clear need to adapt Ostrom's original theory for it to apply to digital data, as it is far removed from the original common-pool resources studied. The first publication identified the work of Marques *et al* (2021), as the paper succinctly captures Ostrom's theory in the context of knowledge. More specifically, Marques *et al* (2021) defined commons as 'common arrangements to overcome various social dilemmas associated with sharing and producing information, innovation and creative work'.

This definition is appropriate for the smart city context, even if it strictly speaking applies to information and creative work rather than data, as sharing smart city data is capable of influencing the lives of smart citizens in many different ways.

To delve deeper into data specifically, Ostrom (2007) herself noted that data is a common good, as it provides for both collective use and benefits to society through innovation. Consequently, unlike with traditional resources where the threat to a traditional common-pool resource is exhaustion, with knowledge it is the opposite, the prevention of innovation through 'anti-commons', where knowledge is not shared. However, it is evident, this is not adequate in the context of NSCDC, as it is not merely the threat of anti-commons, but rather the negative effects for the community of sharing data that must additionally be considered, as explained above.

As Purtova and van Maanen (2024) note, there are (at least) four different claims that have been used to specifically apply the commons analysis to data:

1. Data possesses the characteristics of a common-pool resource and is therefore particularly well-suited for collective governance
2. Other data-related goods are a common-pool resource even if data itself is not, and as such should be collectively governed to ensure sustainability
3. When data is governed in common, it becomes a commons
4. A political-moral claim that data ought to be governed in a commons

In line with the background context of NSCDC, the complex interplay of legal, social, and corporate-led smart city visions warrants collective governance of non-personal smart city data as a commons. Consequently, this is the reason, for this thesis, why the third approach listed above found in the GKC framework suffices, as the exigencies of the background factors warrant collective governance. Hence, besides highlighting that an inappropriate sharing arrangement of non-personal smart city data will result not only in an 'anti-commons' but will also affect the lives of the communities in which the data is generated. This thesis does not engage in-depth in the debate on whether data is a common-pool resource or not. Rather, the focus is on whether collective governance of non-personal smart city data would even be possible under the current EU legal framework. Thus, many of the finer points of how it will be governed do not impact the analysis significantly. Instead, the focus remains on whether such a collective could govern sharing non-personal data, and whether their decision-making would be legislatively restricted. As demonstrated by the second publication, competition law is indeed able to restrict such decision-making. Nevertheless, the overall focus remains on whether an NSCDC could have the capacity to share data based on community interest.

The purpose of a commons in this context is, therefore, ultimately to make decisions and manage the resource that is common to the community, in this non-personal smart city data. As Ostrom (1990) noted, the principle of subsidiarity is crucial in this regard for long-lasting commons, and the individuals affected must also be the ones to modify the rules (Ostrom, 1990, p. 93). This aligns with the EU principle of subsidiarity, where the decision should be made at the lowest possible level (Pimenova, 2016). This, in turn, leads to the aspect of the GKC commons research framework, of who the community members are. Considering the nature of data collection and its effect, such as in the *Waze* case, it is logical that, utilizing the subsidiarity principle, the commons should be restricted to those individuals who live within the sensor network in question. Because it is their lives that will be most directly impacted by sharing decisions for that data. This thesis does not seek to offer a definitive answer on how large an NSCDC should be,

as it may make sense in the case of larger cities to have multiple commons, each representing some geographically distinct section. As an overall principle, though, the commons should be construed of those natural persons who live within the network of sensors that construe the smart city in question.

For if one considers the primary objective of the commons, it is to balance the economic, scientific, and other benefits of sharing data against the potential downside sharing this data has, impacting the local community. Hence, the community should logically be construed from those natural persons who are most affected by sharing data in the smart city in question. Secondly, a commons may have the objective to maintain and upkeep the infrastructure forming the smart city that harvests the data they govern. Alternatively, as data undoubtedly holds value and worth, a commons may even choose to raise funds for the community through sharing it, although this does not constitute the primary purpose of the treaty, and it should not be viewed as a profit-driven entity. Consequently, some economic goals are likely to be relevant for such a commons. As demonstrated in the third publication, the possibility of receiving formal recognition under the EU legal framework may come at the cost of some of these economic goals.

The legal capacity to not only be recognized, but additionally the opportunity to act and enter into transactions lies at the heart of both of these goals. Hence, it is inevitable that an NSCDC will need to be recognized under the legal system of the EU MS in which it operates. Moreover, it must be able to exercise its primary function of sharing data, which necessarily implies that it has, if not ownership, at least the right to decide how that data is shared, as Beckwith *et al* (2018) and Balestrini (2017) demonstrated in their case studies, that the community may have its own interests at heart, by not sharing data openly with everyone. Hence, as noted in the first publication, commons are not necessarily synonymous with open data (**I Publication**, p. 18). Nevertheless, the types of decisions that such a commons can make are not as relevant for this thesis as its capacity to make them, with the notable exception that it may be desirable to exercise discretion in whom data is shared with. This latter exception forms a special case that is discussed in more detail in the second publication, as it may give rise to conflict with competition law. Moreover, absent a legal form, the resulting commons would be unable to pursue legal actions against entities that would violate the conditions they shared data under. Hence, to contextualize this in terms of the GKC framework, the most basic legal structure that must exist within an NSCDC is a legal form. Thus, in terms of the overall scope of this thesis, the focus is on whether such a commons would have the legal ability and capacity to share or not share non-personal smart city data, while the exact principles on which the decision is made are outside of the scope.

Consequently, a picture of the NSCDC is synthesized with help from the GKC commons research framework. A commons born out of necessity due to the legal interplay of the Open Data Directive and GDPR, the corporate-led approach found in both the European Strategy for Data and smart city initiatives, as well as the capacity of non-personal data to affect communities. This commons sees its primary purpose as balancing the risk of 'anti-commons' from insufficient sharing of data against communal harm inflicted by sharing it too much. To accommodate this, the commons must have the legal capacity to either accept or deny the sharing of data. This commons is not necessarily free of economic or commercial considerations, as it may have a secondary goal of raising funds needed to maintain the sensory network and infrastructure, although it should not be understood to be a profit-driven entity. From this construction base of an NSCDC, it is possible to identify possible legal conflicts and thereby answer the first sub-question.

2.1.3 Legal Issues with the Commons

As noted above, no actual NSCDC were identified in the literature review in the first publication, and as such, the legal issues subsequently identified were revealed based on the commons construed in the previous section. This naturally limits the depth of analysis to primary functions of the commons and their legality. However, this was not an issue, as demonstrated by the literature review, for essentially no legal perspectives were identified. Consequently, the novelty of this research became evident as there is a significant lack of academic papers approaching this topic from a primarily legal perspective. Hence, while there is plenty of scope left for future research to examine various other functions of a proposed NSCDC, this thesis nevertheless serves to break new ground on the compatibility of governing non-personal smart city data collectively through a commons.

The question of legal form is particularly important in determining whether an NSCDC would be subject to competition law, and therefore, the restrictions therein. This represents a potentially existential issue for such a commons, as demonstrated above, if the commons were only able to 'choose' to release data without being able to restrict it due to limitations of competition law, this would be of no use. As such, this would mean that the *status quo* brought about by the Open Data Directive would not be significantly different or changed, rendering such collective governance by and large useless.

This is particularly relevant from the EU perspective, as the EU strategy for the Digital Decade specifically highlights the significant economic value of sharing data, thereby clearly indicating its status as a priority. Furthermore, as can be extrapolated from the Waze example, having access to such data may mean that businesses, such as taxis and logistics companies, can optimize their operations and derive competitive advantages. Therefore, should access to such data be restricted, it is evident that not only would there be an economic cost, but such a decision may additionally favour some businesses more than others if data is not shared equally, hence creating a competitive imbalance. All of this leads to a seemingly inevitable conflict with competitive law, which were identified in the first publication and addressed in detail in the second publication.

A corollary legal issue was identified that is no less existential, namely, the ability of the commons to either take ownership or stewardship of non-personal data and to legally enter into transactions. This inevitably implies that the commons must have a legally recognized form that can fulfil both of these functions. This legal aspect was mentioned in passing in literature examined in the first publication, where it was noted that non-profit associations (Balestrini *et al*, 2017, p. 2288) and trusts (Chyi and Wu, 2023, pp. 85–86) have both been used as legal forms for commons in national contexts. However, it is worth noting that the commons identified did not govern non-personal data, ownership of which, especially when not intellectual property, is complicated in the EU (**III Publication**, p. 17). Moreover, the scope of this thesis is not at a national level, but rather at the EU-wide level, so the ideal solution would therefore be a legal form that is specific for handling data, and which exists in the EU legal order. The (then) newly introduced Data Governance Act (DGA) provided possible solutions through the Data Intermediation Service and/or Data Altruism Organization as a means to provide formal recognition for NSCDCs within the EU legal order. Therefore, this was identified as the second most important legal issue to be addressed, as it is a prerequisite for proper functioning of an NSCDC. As a result, the third publication was dedicated to examining whether the DGA could represent a means of providing formal recognition for NSCDCs under the EU legal framework.

A similar, although not as immediate, legal concern was identified with the apparent lack of a suitable dispute resolution mechanism. As noted by Ostrom (1990), quick access to a rapid low-cost local conflict resolution mechanism is essential for the long-term sustainability of a commons (Ostrom, 1990, p. 100). Similarly, within the GKC framework, the dispute resolution mechanism is likewise highlighted as an important aspect (Madison, Frischmann, and Strandburg, 2019, p. 13). This was identified in the first publication's literature review as well, as Balestrini *et al* (2017) noted how those commons type community projects often fail due to a lack of conflict resolution. If implemented, social dilemmas and conflicts are practically inevitable even within a commons. The interests of various smart citizens are likely to differ, and to use the Waze example, some might prefer a quiet(er) neighbourhood, others might be willing to share dynamic data with certain businesses for a cost, while yet others may wish to share the data for free. If no quickly accessible and low-cost dispute resolution service is available, relationships within the commons are likely to become inflammatory, and decision-making, as well as the functioning of commons may cease entirely. However, as a smart city data commons would be located in a highly regulated city environment, the less-than-formal solutions described by Ostrom (1990) would not be suitable. Consequently, there is a dire need for a low-cost conflict resolution method that is backed by legal authority to produce enforceable decisions and solve conflicts.

In the first publication, a suggestion is made for an arbitration mechanism that could serve to resolve conflicts, not only within the commons, but also with external actors such as businesses, who feel they have been treated unfairly. The reason for proposing an arbitration model is the same as the spirit of Ostrom's commons, that is to say, an escape from the public-private dichotomy. An arbitration panel may be constituted so that it represents all sides in the conflict fairly, as the parties to the dispute each nominate an arbitrator. This would mean that the community of the commons would always be represented, regardless of who the other party to the dispute may be. Moreover, arbitration would enable the resulting resolution of the conflict to be legally binding in the form of an award, which would enable the commons to move forward after a conflict. However, this was not explored further in a dedicated publication, and therefore it remains an avenue for future research. The reasoning for not pursuing it was that it is not arguably as immediate a threat to smart city data commons as the other two issues identified. For if a commons cannot be given a legal form, it is impossible to implement it as a decision-making body in a smart city, and as such, this must be resolved right away. Similarly, a looming unresolved conflict under competition law threatens the most fundamental activity of a commons, the management and decision-making related to the resource, and without it, there can be no meaningful commons. Consequently, these two issues must be addressed first, as they are existential issues for all such smart city data commons, whereas the lack of a conflict resolution mechanism is more of a long-term threat, to be dealt with further down the road once the commons is operating. Nevertheless, as demonstrated, this is an incredibly important aspect for any commons to resolve; for as was noted, if it is neglected, any such commons is at dire risk of being unsustainable for the long term.

In conclusion, through utilizing the adapted GKC research framework for an EU NSCDC, the first sub-question was answered through identifying several legal issues that must be resolved. Firstly, the question of the legal form of such a commons is crucial in determining the ability of the commons to function as a means of governance for non-personal smart

city data. Secondly, competition law was identified as representing a potentially existential threat to NSCDCs, through possible restrictions on decision-making of such a commons, especially concerning its ability to decide not to share data.

2.2 A Looming Conflict with Competition law

Based on the results of the first sub-question, it became clear that the second sub-question represented an existential issue for a commons. This question of whether EU competition law is compatible with governance of non-personal smart city data through commons, was primarily addressed in the second publication. As a result, the second publication focused on the threat posed by EU competition law on the ability of smart city data commons to make decisions regarding the sharing of data. Therefore, an in-depth analysis of the primary sources, the Treaty on the Functioning of the European Union (TFEU), and relevant case law was both warranted and necessary. As such, the focus of the second publication was analysing the existing provisions and case law, and applying them to an NSCDC, to either disprove or confirm the existential threat to a meaningful smart city data commons that was *prima facie* identified in the first publication.

Furthermore, the second publication addressed the issue of the legal form of a smart city data commons, identified in the first publication, as it is intrinsically linked to competition law, and as such, the paper addresses both. Firstly, it must be established whether a smart city data commons would even be in the scope of EU law before proceeding further and analysing possible conflicts. Thus, logically, the first item to address was to determine what legal form the smart city data commons can take, and whether these would lie in the scope of competition law.

Both of these analyses contribute to elucidating which legal structures apply to an NSCDC, as warranted by the GKC research framework. Therefore, findings relating to the second sub-question determined whether competition law as such would apply to NSCDC, and if so, under what conditions, and what practical implications it might have on the governance of an NSCDC. Concerning the latter, it is evident that if competition law applies, there is a need to adjust the internal functioning of the NSCDC to ensure compliance. As such, the answer to the second sub-question also bears relevance to the GKC's framework questions on internal governance mechanisms, and who the decision-makers should be, and their qualifications, depending on whether competition law is applicable. This, in turn, will help establish future NSCDCs by indicating which practical arrangements may be necessary to avoid a conflict with EU competition law.

2.2.1 Smart City Data Commons and the Scope of Competition Law

The overall scope of this thesis is on an EU-wide level, rather than merely the national level, which *prima facie* creates a problem, that it is necessary to explore all possible national alternatives for a legal form for a commons in all Member States. From the literature reviewed, non-profit associations (Balestrini *et al*, 2017, p. 2288) and trusts (Chyi and Wu, 2023, pp. 85–86) have both been in national contexts. However, this seemingly unmanageable expansion of the overall research's scope is not nearly as dire as it may first appear. Because there are fundamentally only two aspects that must be established, firstly, can a legal form be given to a commons in a city environment, and secondly, do such legal forms lie in the scope of EU competition law? The answer to the former is clearly yes, as demonstrated by the use of non-profit associations and trusts. The answer to the latter can be established without knowing all the possible legal forms that are available in the Member States for commons.

EU competition law applies to all 'undertakings', which is a term not defined in the TFEU, but rather, defined in case law (Odudu, 2005, p. 213). As explained in *Höfner*, the legal form of the entity is irrelevant, as all entities that are "engaged in economic activity, regardless of legal status… or the way it is financed" are considered 'undertakings'. Therefore, the exact form under the national law of a Member State is irrelevant, and for the purposes of this research, there is no need to explore all such possibilities. Rather, the focus is entirely on whether the actions of a smart city data commons can be considered 'economic activity'.

As demonstrated by the second publication, this determination is far less straightforward than one might expect. This is due to a circular definition by the Court of Justice of the European Union (CJEU), whereby economic activity is defined as 'offering of goods and service on the market', which constitutes a less than optimal definition, as the term "market" is treated identically to "economic" (van de Gronden, 2018, p. 199). Should a commons offer to sell data, it would fall under the definition of economic activity. However, as it turns out, that does not imply that those commons not engaging in financial transactions would be able to escape the definition of 'economic activity'.

For, as determined in the CJEU case law, competition is an essential component of 'economic activity' (ibid). Moreover, case law has established that this even extends to seemingly not-for-profit entities, such as motorcycle races (*MOTOE*, 2008), which, in the view of the CJEU, are still competing with other motorcycle races to survive. Therefore, even if a smart city data commons did not engage directly in financial transactions, as long as it can be considered to need to compete with other commons (or other entities) to survive, it will be considered as exercising 'economic activity'.

At this stage, the second publication provides an original contribution by analysing whether a smart city data commons must indeed compete to survive. As with many difficult questions in law, the answer to this is, 'it depends'. In this case, it depends on the definition of the market it does (*or does not*) compete in. In theory, if a single commons covers the whole of a smart city, it could be argued that it does not need to compete and fight for its existence, as there are no feasible alternatives to the data it obtains from the sensor network comprising the smart city. This is especially true for downstream markets, such as data analysis services, that would depend on the availability of data from the smart city, and thus, by extension, from the commons. Hence, in some circumstances, it can be said that a smart city commons holds a natural monopoly, and as such, could be interpreted as not needing to compete.

However, this view is unlikely to hold up for several reasons. Firstly, larger smart cities in particular may be divided into multiple commons, where competition would naturally arise between the commons, as those commons that share data, if the EU digital strategy for data were to be believed (European Commission, 2020), would thrive in economic terms, over those that do not. This thriving would be the result of businesses preferring the areas/commons that are willing to share the data they need to operate more effectively than companies that do not use smart city data to make their operations more effective. Competition would clearly exist in such a situation.

Moreover, if one takes a wider perspective, the same will hold true on a national level when comparing (smart) cities to one another. As for the same reasons described above, prosperity will flow to those cities that manage their data in a more business-friendly manner. This can be scaled up to the EU Member State level, where such choices will begin to impact the attractiveness of whole countries for businesses. As such, there will clearly not only be competition, but rather, such decisions will also have the potential to

affect trade between Member States, which will put smart city data commons within the ambit of EU competition law. Consequently, while it is beyond the scope of this research to definitively confirm that smart city data commons actually do engage in competition to survive, in the context of EU competition law, and as such amount to 'undertakings', this seems not only plausible, but probable. Naturally, final confirmation can only be obtained once the CJEU has actually decided on the matter, which can only happen once there is an attempt to implement smart city data commons, that leads to a case being presented before the CJEU. However, the second publication has demonstrated that it is at the very least plausible that regardless of the exact legal form a smart city data commons takes, it will be considered an 'undertaking', and will lie in the scope of EU competition law. Therefore, the second publication identified that no choice of legal form adopted by an NSCDC would enable it to escape the scope of competition law. As a corollary, competition law implications of decisions made in an NSCDC would need to be considered during its operation. Consequently, this would necessitate legal expertise in the form of a lawyer being incorporated into the decision-making of such a commons. This aspect should be considered when establishing an NSCDC, and should be addressed by selecting a decision-maker competent to assess whether decisions taken by an NSCDC are likely to violate EU competition law. Alternatively, it could be that before making decisions on sharing data, external (or internal) legal advice should be sought to confirm whether the data-sharing decision would be likely to violate competition law.

2.2.2 Article 101 TFEU – A Potential Limit to How Data Can be Shared

Having established that smart city data commons are plausibly in the scope of EU competition law, the likely types of conflict that may arise must be examined. The most readily evident source for these legal conflicts is the ability of smart city data commons to decide with whom they will share the data that they govern, and under what conditions. This includes the opportunity to combine various commons to form larger pools of data, which, as a result, will have greater market power and value. From the competition law perspective, it is relevant that this may cross Member State borders. Smart city proposals exist that would serve to connect smart cities, such as the FinEst Twins project that proposes creating a cross-border smart city centre of excellence for Tallinn and Helsinki (Soe, 2022, p. 3). Therefore, it is not unreasonable to suggest that smart city data could be shared across borders through such initiatives, provided the relevant commons agree to this.

EU competition law will become relevant for any such agreements, which could potentially affect trade between Member States. While cross-border pooling of data definitely qualifies for this, it could also extend to pooling data between various smart cities even within a country, depending on the exact circumstances. It is not possible in the context of this research to state all such circumstances in the abstract, but nevertheless it can be clearly stated that the potential for such arrangements exists and that they can fall into the scope of EU competition law.

As a result, Article 101 of TFEU could become a limiting factor for decisions such smart city data commons could make. Article 101 is intended to prevent harmful agreements between undertakings that restrict or distort competition in the EU internal market. Therefore, as smart city data commons can be undertakings, and as nothing prevents them from forming agreements on governance of their data to form larger pools, these types of agreements could fall afoul of Article 101 if they are deemed to exercise a negative influence on competition. Various possibilities exist for decisions of a commons to fall

afoul of the types of violations described in sub-sections (a) through (e) as a commons is in principle free to decide what it does with the data, who it wishes to pool data with, and under what conditions it will agree to share it. As such, price fixing (a), limiting or controlling markets through data-sharing decisions, as well as applying dissimilar conditions to equivalent transactions (d), are all potentially possible. Therefore, Article 101 TFEU must be considered in cases where these decisions have the opportunity to influence trade in the internal market. Moreover, barring actual case law, smart city data commons should be prepared, such that potentially even decisions pertaining only to a single smart city may attract attention concerning EU competition law, as it can be argued these also distort trade in the internal marketplace, by changing its level of attractiveness for movement of capital or businesses within the EU. However, once again, this cannot be confirmed in the abstract, but rather one must wait for actual case law, once a smart city data commons is (un)fortunate enough to end up in a case before the CJEU.

In addition to our finding that Article 101 TFEU has the potential to affect smart city data commons, another important finding was the somewhat conflicting logic underlying potential action against commons in this context. Namely, EU competition law is ultimately there to protect the consumer, although in the competition law context, this also includes businesses as well as natural persons, unlike consumer protection, which only considers the latter to be consumers (Robertson, 2018, p. 40). Therefore, the fundamental purpose is in no small measure to protect natural persons from the negative effects of market distortion. However, in the context of smart city data commons, the situation is rather more difficult than ordinarily is the case, where businesses seeking to maximize their competitive advantage and profits form agreements that ultimately harm consumers. For, while equally within the scope of EU competition law, the purpose of a smart city data commons is to (self-)govern the smart city data that is produced around the smart citizens living in that city, to ensure that they are empowered concerning their living environment. Therefore, by restricting the decision-making ability of such commons, natural persons living in the area covered by them are effectively deprived of the ability to govern data they produce, and similarly, this restricts their ability to ensure that it is only used in the way that is most consistent with the community's wishes. Consequently, in this particular case, external limits by EU competition law would essentially serve to both disempower smart citizens concerning their surroundings and also to protect consumers from themselves.

It is doubtful whether the EU legislator envisaged this effect. Negative consequences of poor decisions by a smart city data commons will primarily be felt by natural persons in that area and vicinity. This extends in particular to local businesses standing to benefit from optimal use of local data, which could help provide them with a competitive advantage. If businesses in an area are outcompeted, this will inevitably affect individuals living in that area, for example, through loss of employment opportunities. Therefore, unlike businesses, which are the intended target audience for EU competition law, the interests of consumers in the area covered by the smart city data commons are very much aligned, and they do not stand to benefit by causing market-distorting effects through their commons decisions. Consequently, it could be argued that it would be prudent for the special purpose and circumstances of the smart city data commons to be considered in applying the provisions.

However, as explored in the second publication, current approaches are far from encouraging here. This is due to the failure of 'green antitrust', which refers to the idea

that measures that would otherwise violate competition law would be allowed as they are essentially for a good cause, in this case, achieving sustainability and fighting climate change (Veljanovski, 2022). This idea gained some credibility, with national Austrian competition law being amended in 2019 to include a provision that was the 'world's first green exemption' to those provisions therein (Zelger, 2022, p. 515). However, that same year, the Commission released the 2022 Guidelines on Vertical Agreements, which clearly state that such agreements, even if they pursue sustainability, or even 'contribute to a digital and resilient Single Market', are not a separate category that would somehow be exempt.

Moreover, smart city data commons are arguably not conducive as a whole to the EU vision for an agile digital single market where (non-personal) data moves freely. For data commons would add an additional layer, which may serve as an obstacle to automatic movement of (non-personal) data within the EU. As such, the cost of these smart city data commons would be possible fragmentation of the EU digital market for data, as different commons could, and most likely would, have rather different approaches to sharing data, based on their local circumstances. Therefore, this empowerment of local smart citizens through smart city data commons is not without a cost on the EU-wide level. Consequently, smart city data commons would rather serve to hinder than to help transition towards a digital single market, and therefore, such initiatives are likely to be rather far removed from being desirable, from an EU perspective. Thus, where even beneficial arrangements to the digital single market do not receive special privileges with regard to competition law, it is highly unlikely that the smart city data commons would do so either. As a result, the second publication found that violations of Article 101 TFEU must be considered concerning smart city data commons, and they may restrict the types of agreements and decisions such a commons could make. Moreover, it is unlikely that any (positive) special treatment will be granted to smart city data commons from a competition law perspective.

2.2.3 Article 102 TFEU – Smart City Data as an Essential Facility

Smart city data commons essentially have a natural monopoly over data produced in the area of the smart city they govern, as the data they govern is derived from the sensor network. As a result, there is no replacement or alternative source for the data controlled by commons. This is inevitable if the commons should empower local smart citizens about data that they involuntarily produce every day, and enable them to solve the resulting social dilemmas that may arise from sharing that data. However, as noted by the EU Strategy for Data, not just efficiency for the smart city or businesses, but also new products and services that can be created from such data (European Commission, 2020, pp. 2–3). As a result, the provision on dominant undertakings under EU competition law becomes extremely relevant, as it is intended to govern such situations where one undertaking, in this case the commons, has control of a resource that is crucial for other goods or services to emerge (Tommaso, 2020, p. 196).

Therefore, it is almost inevitable that a decision from a smart city data commons not to share data, or to only share data with certain entities, could be in conflict with this provision. Such decisions can easily escalate to the extent that they can be said to affect trade between Member States and, as such, lie within the scope of EU competition law, especially if favouritism is displayed, e.g., towards local or national businesses. Moreover, it is undeniable that smart city data commons will command such a dominant position as it is a natural monopoly over the resource, in this case, the non-personal

smart city data, which only they can dispense. Therefore, concerning the 'Essential Facilities Doctrine' (EFD), although technically it is called 'refusal to deal' by the CJEU (Graef, 2019, pp. 41–43), the term 'EFD' will be used for the sake of brevity in this paper, and this must be considered under Article 102.

Based on case law, there is an established three-step test under the *Bronner* criteria. Firstly, the refusal is not objectively justified, secondly, the resource is indispensable, and thirdly, the refusal is likely to eliminate all competition (Czapracka, 2022, p. 278). However, there is a specific line of case law that pertains to data, although not to smart city data. This is noteworthy, as the European Court of Justice (ECJ) granted access to data (Bruc, 2019, p. 185). Under this case law, the *Bronner* criteria are slightly different. The first requirement is that the refusal prevents a new product, secondly, it is unjustified, and thirdly, this refusal must exclude any competition on the secondary market (*IMS Health,* para 38). Strictly speaking, the case law pertains to data protected by copyright, which is a limitation, even if this case is considered to widely apply in the context of data (Slepak, 2020, p. 5).

Furthermore, the *IMS Health* criteria were lowered further by the General Court in the Microsoft case, which has yet to be confirmed by the ECJ (Graef, 2019, p. 46). Under the lower criteria, "likely" prevention of an "effective contribution" suffices, rather than 'prevention' of a new product as per the *IMS Health* criteria. This is a significantly lower threshold, and as such, even without considering the specifics of smart city data commons, it would likely apply, simply because it pertains to data which the Commission contends can create new products and services (Commission, 2020, pp. 2–3). Nevertheless, in the case of smart city data commons, the situation regarding the first criteria is arguably even clearer. Recalling the relationship between data, information, and knowledge by Ostrom and Hess (2007), where data must be processed to form information, and information forms the basis for knowledge, these further processing steps for data can also be carried out as a service. As such, the definition set by the GC can be satisfied merely by downstream data analysis services from being 'likely' to be prevented from making an 'effective contribution', as they would lack access to smart city data that would form the basis of their processing. This would also fit with the *IMS Health* criteria, as it would be impossible to provide such services without access to the primary resource required, the smart city data itself, which would eliminate competition in downstream markets, fulfilling the third criteria. Consequently, the second publication found that the first and third steps are likely to be fulfilled by a decision taken by a smart city data commons that refuses to share data, or does so by applying dissimilar conditions to otherwise equivalent transactions.

Therefore, proceeding to the next step, an objective justification that is accepted would prevent the decision from being considered a violation of Article 102 TFEU (van der Vijver, 2012, p. 60). The three possible grounds for these exceptions do not, however, readily apply in the smart city data context. Legitimate business behaviour is potentially an accepted justification, however, a commons is not a business as such, but rather it is a method for the local community to govern a resource. This does not necessarily exclude opportunities to make a profit, however, this is not the primary purpose of the commons, and as such, its actions are not guided by the same logic as that of businesses. Similarly, it would be difficult to apply the second ground of efficiency. Hence, these two justifications are unlikely to be applicable.

Finally, there is the possibility of relying on public interest objectives. This sounds *prima facie* to be the most promising in the smart city data context, as that is arguably

what the commons does, pursuing the community's interests and therefore by extension those of the public. However, case law is less than encouraging in this respect, as the case law record demonstrates a series of failed attempts to rely on this justification, although generally due to the facts of the case itself rather than the concept of actual public interest (van der Vijver, 2012, p. 60). Furthermore, successfully using this criterion can arguably be an uphill battle in the context of smart city data commons, as this does not pertain to public safety, which is an accepted ground. Moreover, the EU legal framework is not favourable towards the idea that non-personal data can have negative effects on individuals, and therefore, it may be that governance of such data would not necessarily be recognized as falling under the justification of public interest. Although the possibility that it could be accepted as a justification is undoubtedly there, as it could be interpreted as a reflection of community needs. However, once again, it is not possible to reach a firm conclusion, as it will ultimately be up to the CJEU to definitively settle this matter, and as above, there is a need to wait for actual case law specific to this context. However, the second publication nevertheless conclusively demonstrated that decisions taken by a smart city data commons may violate Article 102 TFEU in certain circumstances.

In conclusion, overall, the second publication provided numerous important findings for overall research, through its answer to the second sub-question. It established that regardless of the precise legal form a smart city data commons may take, it is likely to be considered an 'undertaking' in the sense of EU competition law and as such within its scope. Secondly, violations of both Article 101 and 102 TFEU may occur, and should be considered once there is an attempt to implement smart city data commons in practice. These potential violations can significantly influence the NSCDC's decision-making. In particular, decisions that potentially restrict the emergence of products and services downstream are likely to attract scrutiny under competition law. Similarly, decisions to share the same data to different entities under differing conditions have appreciable potential for falling afoul of EU competition law. This in turn represents a significant negative outcome that may result from the decision-making of an NSCDC, and should be considered seriously, if such a commons is to be implemented.

Consequently, these findings have significant implications for the internal decision-making of an NSCDC. Firstly, legal expertise may be required to navigate the implications of decisions to share or not share data through the commons. In particular, where similar or the same data has been shared with different entities under different conditions. What is more, if the commons decides that it wishes to pool its data with another commons, this is another case where legal analysis would need to ensure that Article 101 TFEU is not violated. Therefore, an NSCDC should be cognizant of potential competition law implications of its decisions at all times.

2.3 Data Governance Act, The Way Forward?

The focus of the third and final publication is the way forward, as a means of recognizing NSCDCs under the EU framework, to answer the third sub-question on whether the DGA could be used to formally recognize NSCDCs in the EU legal framework. The Data Governance Act, which came into effect towards the end of this research, in September 2023, delivered intriguing opportunities for smart city data commons through the introduction of its data intermediation services and data altruism organizations. These possibilities represent a means of having NSCDCs recognized under the existing EU legal framework, thereby legitimizing them and enabling them to assume ownership/stewardship of non-personal data.

This sub-question completes the answer to the GKC framework's question on applicable legal structures for the NSCDC, as explored within the scope of this thesis. As was established through the answer to the second sub-question, EU competition law applies to NSCDCs and should be considered in their internal decision-making. Furthermore, as was noted in section 2.2.1, this will be the case, regardless of the precise legal form that an NSCDC applies in its domestic framework. However, due to the introduction of DGA, it is still possible to further answer the question on legal structures, while remaining within the thesis's EU-wide scope. As noted above, the DGA introduces legal structures that, while not a legal form (such as a not-for-profit association or a trust), nevertheless provide recognition and thereby formalize an entity regarding both the EU legal framework and the domestic legal system. This, in turn, addresses the difficult question of how, precisely, an NSCDC can actually assert ownership of non-personal data, which is outside the scope of traditional IP rights. Therefore, if an NSCDC could be fitted to the newly introduced legal structures under the DGA, it would be recognized as an entity entitled to have ownership or stewardship over non-personal data.

This, in turn, on a practical level means that if an NSCDC were to be established, the decision on which legal form to use under domestic law (e.g. a non-profit association) needs to be aligned with requirements of DGA, and then to function either as a Data Intermediary or a Data Altruism Organization. And this all being dependent on whether opportunities offered by the DGA can be utilized in the NSCDC context. Nevertheless, the result of analysing DGA will complete the answer to the question of which legal structures apply to NSCDCs as warranted by the GKC framework. If the forms of the DGA are suitable, that would mean that an NSCDC would need to, firstly, comply with competition law as stated in Section 2.2. Secondly, it would need to choose the domestic legal form which incorporates the NSCDC into the national legal order, while considering the requirements of the DGA to ensure subsequent compliance, which in combination ensures the actual ability to have ownership/stewardship of non-personal data.

2.3.1 Data Holders under the DGA

Whilst the issue of legal form of a smart city data commons was broadly addressed in the second publication, that is to say, whether a commons would be an 'undertaking', this did not resolve the question of whether it could possess and share non-personal data. The topic of data ownership under the auspices of the EU legal framework is a complicated topic, to put it mildly, with various possibilities such as through copyright protection or *sui generis* protection of databases. This is especially problematic for smart city non-personal data. It is not eligible for copyright protection because it was not created by an individual's intellect. Database protection is likewise only available if it constitutes an intellectual creation (Koscik and Myska, 2017, p. 52). The DGA somewhat simplifies the situation with its concept of "data holder", which is defined as a legal person, public sector body, or natural person that is not the data subject who, according to national or EU law, has the right to share or grant access to that personal or non-personal data (**III Publication, p.6**). An important takeaway is the need to have either national or EU law authority to share or grant access to the data. This further stresses the need to empower the smart city data commons, either through EU or national law, to permit it to be considered the data holder.

This, in turn, strengthens the argument that if a smart city data commons could fit into the definition of "data intermediation services" or "data altruism organization", which

were introduced under the DGA, then practically implementing them would be a lot easier. As it would arguably be far more difficult to create new national legislation that would empower smart city data commons to operate and function than it would be to amend the existing national legal framework to empower data intermediaries or data altruism organizations to grant access or share data they hold. Consequently, the analysis in the third publication of whether either type of organization introduced by the DGA could fit a smart city data commons is crucial for establishing a realistic pathway to practically implementing smart city data commons.

2.3.2 Findings on Data Intermediaries

The purpose of a data intermediation service, or data intermediary for short, under the Data Governance Act is to facilitate and share large amounts of data to create a common European dataspace. Which at first glance might appear to be a promising form for a smart city data commons. However, as the findings in the third publication reflect, the data intermediary is rather a poor fit for a smart city data commons.

The first problem is data intermediaries' fundamentally commercial character, as their purpose is to establish commercial relationships for data sharing (Carovano, Finck, (2023), p. 5). As noted in Article 2(11) of DGA, only those services whose aim is to establish commercial relationships for data sharing will fit the definition in the first place. This conflicts with the fundamental primary purpose of resolving social dilemmas that arises for smart city data commons through sharing non-personal data. While making commercial transactions may be a part of the actions of a smart city data commons, it is not intended to be the primary guiding principle.

This is exacerbated by the exclusion written into DGA under Article 2(11)(c), where services that cater to a 'closed group' are outside the definition of a data intermediary. This places a smart city data commons that does not share data openly or equally, but rather discerns who it shares data with based on community interest, at risk of falling outside the definition. Furthermore, as decisions about who the data must be shared with should not be made based on commercial grounds, but rather on grounds of community interest, this raises serious doubts that a smart city data commons could reasonably fit with the definition of data intermediary under DGA.

Consequently, owing to the primarily commercial nature of data intermediaries, along with the obligation not to cater to a closed group, arguably, the definition of a data intermediary service is not a viable classification for smart city data commons. The latter requirement under Article 2(11)(c), of not sharing data with a closed group, would fundamentally alter the character and decision-making ability of the commons, to the extent that it would no longer function as a commons. For a commons that cannot deny the sharing of data to solve social dilemmas, is no longer a commons.

2.3.3 Findings of Data Altruism Organizations

In contrast to data intermediaries, data altruism organizations are not commercially driven and arguably represent a much better fit for an NSCDC. Under the DGA, data altruism organizations voluntarily make data available for general interest objectives (DGA, Recital 45). Therefore, the classification is much better suited for a smart city data commons as their purposes are far better aligned, especially when compared to the alternative of a data intermediary service.

The DGA does not exhaustively cover what 'objectives of general interest' extend to. Instead, under Article 18 (b), it leaves it up to national legislation to finally determine

what types of objectives can be served by data altruism organizations. This represents an important opportunity from the perspective of smart city data commons. As was noted in the section on data holders, it would be far simpler to amend the national law that must already describe the legitimate objectives data altruism organizations can pursue to include self-governance of smart city data through commons than it would be to create an entirely new piece of legislation solely for that purpose. Consequently, the third publication found in this regard that the definition of a data altruism organization is broad enough to encompass a smart city data commons, and represents an excellent opportunity to provide a legal structure recognized in terms of the EU legal framework for such a commons.

That being said, there is an opportunity cost attached to utilizing the data altruism organization as one form for a smart city data commons. This cost is quite literal in this case, as data altruism organizations must operate on a not-for-profit basis (DGA, Article 18(c)). This does not necessarily imply that no financial compensation can be extracted from sharing the data, but instead, it is merely limited. As noted in DGA, fees extracted in this way must be limited to what is required to cover costs incurred in making the data available (Article 2(16)).

As noted above, NSCDCs may have secondary financial considerations they wish to pursue with their decision-making. For example, an NSCDC might wish to leverage economic value of the data they produce, and sell it to finance various community ends. However, under the DGA, this would be limited to using fees for upkeep and maintenance of the sensor network generating data in the smart city, as well as any administrative costs incurred to maintain the data altruism organization. As a result, sharing profits amongst the community is not possible while operating as a data altruism organization. While undoubtedly a downside, it is perhaps not that much of a departure from the way commons are set up now, as not-for-profit organizations have already been used as the legal form for commons (Balestrini, 2017).

Furthermore, a data altruism organization would not require any compromise to the fundamental purpose of the commons, that is, the self-governance of data to resolve social dilemmas that impact the community as a result of sharing smart city data. Hence, while it is unfortunate that the community will still be required to forgo much of the economic potential of the data, the DGA's requirements will not interfere with its primary purpose of collectively governing sharing of non-personal smart city data.

Consequently, it can be concluded here that data altruism organizations represent a practical way forward for smart city data commons under the EU legal framework. The concept of 'objectives of general interest' is arguably wide enough to encompass that of a smart city data commons. Moreover, relatively small changes will be needed to the domestic legal framework to implement smart city data commons as a data altruism organization, by including self-governance of smart city data of local communities through commons as a legitimate objective of general interest. As a result, this finding of suitability of a data altruism organization will be of significant importance to initiatives that attempt to implement smart city data commons in the future, as it gives legal form and certainty to such initiatives. Furthermore, it provides a viable legal structure for an NSCDC that is recognized under the EU legal framework. Thus, as explained in Section 2.3 above, practically this means that when choosing a legal form for an NSCDC, it should be able to comply with DGA requirements for a data altruism organization, ensuring that it has the legal ability to govern non-personal smart city data. Hence, to summarize, the DGA's requirements for a data altruism organization should be considered when

choosing the national legal form for establishing a NSCDC. For example, if a not-for-profit association is chosen as the legal form domestically, the articles of association should be written to align with the envisioned tasks of a data altruism organization to ensure DGA compliance.

Therefore, in terms of the GKC framework, the question as to what legal structures apply to a NSCDC has been answered from the perspective of the EU legal framework. As was demonstrated in section 2.2.3, a NSCDC regardless of its exact legal form will have to be cognizant of competition law and ensure its decisions are compliant thereto. Furthermore, as identified in this section, the DGA's requirements must considered when choosing a legal form on the domestic level, to ensure that it will be recognized as a data altruism organization and thus be able to function as a NSCDC. Consequently, the legal structures associated with an NSCDC must be aligned with the EU legal framework, which, as clearly demonstrated, is a consideration that cannot be ignored when establishing a non-personal data commons.

3 Conclusions

The case for governing non-personal smart city data collectively is one born of exigencies. Automatic sharing of sensor data under the Open Data Directive, the corporate-led approach embodied in smart city projects (Cardullo, Kitchin, 2019a, Knieps, 2017), the EU strategy for data, and increasingly apparent social dilemmas resulting from sharing non-personal data all combine to form a need for collective governance, which is increasingly difficult to ignore. The smart citizen of the future is increasingly treated as an exploitable open data source, and is primarily thought of as a consumer, and is excluded from having meaningful control (Cardullo, Kitchin, 2019b) over (non-personal) data they generate. Moreover, as demonstrated in this thesis, sharing data can negatively impact the community that generates it (**II Publication**, p.4). Consequently, without collective governance, the vision for the average smart citizen appears increasingly grim, exploited for the data they generate via a sensory network around them that forms the smart city they live in, and forced to deal with any negative consequences from automatically sharing it, without any say.

Therefore, there is an increasingly urgent need to both empower smart citizens and to escape the scope of the Open Data Directive's data sharing obligation, which affects data held by public sector bodies. Collective governance through commons covers both these requirements, as it cuts out any middlemen, public or private, as smart citizens are the ones who decide, and take control of the Open Data Directive, as data would no longer be held by a public sector body. In order to establish whether this type of collective governance would be viable for non-personal data, this research focussed on whether such a commons could reasonably operate under the current EU legal framework.

As demonstrated by the literature review in the first publication, this is still a niche, rather specialized field. It appears there has been no significant research or effort put into the legal aspects of implementing an NSCDC. As such, in this respect, this thesis is something of a pathfinder, representing the first few steps that in the future may enable practical implementation of smart city data commons to manage non-personal data. In this sense, this research was conducted somewhat unusually, before these issues had arisen in court, and as such, this thesis has the potential to not only identify but also pre-empt legal conflicts before they happen. To achieve this, the GKC commons research framework (Madison, Frischmann, and Strandburg, 2019) was used to identify legal conflicts that would affect an NSCDC.

The sub-questions for this thesis were all answered, albeit in some cases, these answers led to more questions for future research. The answers to the first sub-question in the first publication, of which parts of the existing EU legal framework have the potential to conflict with smart city data commons, provided the foundation upon which the subsequent publications focussed. The major finding in response to this sub-question was identifying the potentially impending conflict with competition law, which can significantly limit the decision-making ability of smart city data commons, subsequently explored in the second publication. Furthermore, the need for a legal form that enables the commons to possess stewardship of data, pursue legal claims, and enter into legal transactions was identified. The possibility of using the Data Governance Act to recognize NSCDC in the EU legal order was further explored in the third publication. In addition, the first publication identified key avenues for further research. In this respect, the possibility of using local arbitration as a means of dispute resolution for commons was suggested as a solution to improve the often missing or ineffective dispute resolution

methods, which often result in commons failing (Balestrini *et al*, 2017). A second avenue for more extensive research is examining locally available legal forms for commons, such as trusts and/or non-profit associations, and which should be compared and analysed as a practical step before implementing a commons.

Moreover, although it was not the primary purpose of the first publication, the underappreciated role of non-personal data within the EU legal framework, and its implications in a smart city context if left unaddressed, was a major finding. The impacts of non-personal data in a smart city context are not yet fully evident, although simmering beneath the surface, as demonstrated by the Waze case study. The stewing social dilemmas caused by the unlimited sharing of dynamic smart city data will inevitably cause significant issues for the long-term sustainability of a smart city. Furthermore, the first publication similarly demonstrated the suitability of commons as a solution to the sharing of dynamic data mandated by the Open Data Directive, by escaping the private-public dichotomy and instead using community self-governance as a means to fall outside of this obligation for sharing.

As to the second sub-question of whether existing EU competition law is compatible with governance of non-personal smart city data through commons, the answer, as is so often the case with the law, was ultimately, it depends. The second publication demonstrated that NSCDCs are unlikely to escape the scope of competition law, as they can plausibly be considered as 'undertakings' that engage in 'economic activity'. This, in turn, opens the door to violations of EU competition law. Similarly, it was found that violations of both Article 101 and 102 TFEU are indeed possible, and should be considered when making decisions in such a commons.

As a result, there is a possibility that the smart city data commons would be unable to make certain types of decisions regarding sharing of their data, such as when opting to share the data with certain entities but not with others. This, in turn, implies that legal expertise is needed within such a commons for us to remain cognizant of the competition law implications of decisions. Moreover, it is unlikely that such commons would receive special treatment, at least based on the failure of 'green antitrust' (Veljanovski, 2022). Nevertheless, the publication demonstrates that competition law concerns cannot be ignored concerning NSCDCs, and these may restrict the decision-making ability of the commons. However, it is not incompatible with the concept of an NSCDC as such, but it would require a commons to be aware of potential types of violation, and to make decisions accordingly.

Finally, the third sub-question, whether the DGA enables formal recognition of NSCDCs under the EU legal framework, was answered in the affirmative. As demonstrated in the third publication, whilst the classification of a data intermediary would be unsuitable, the classification of a data altruism organization is suitable. However, classification as a data altruism organization would come at a cost, as it would mean that such commons are restricted to operating in a not-for-profit manner. Therefore, the local community is deprived of realizing any profit from sharing data, although any financial remuneration or fees can at least be used to maintain the infrastructure that produces the data.

Consequently, the overall research question of to what extent the EU legal framework is compatible with smart city data commons is answered through these three sub-questions. While there are lingering concerns surrounding competition law, the DGA is a significant opportunity that presents a practical avenue for implementing NSCDCs. As such, this research provides guidance for commons initiatives that are intended to

govern (non-personal) smart city data, on the types of legal pitfalls they may face at EU-wide level.

In this regard, this thesis provides contributions relevant for practical implementation of NSCDCs. As demonstrated by the second publication, there is a definite need for legal expertise when the commons makes decisions on sharing the data they govern. Similarly, if the commons opts to pool their data with other commons, a legal assessment will be required to map the risks of running afoul of EU and/or national competition law. Consequently, it is evident that legal advice must be integrated into the decision-making process of such a commons.

Moreover, as noted in the third publication, data altruism organizations provide a suitable means of incorporating NSCDCs into the EU legal order. However, this can only be completed after local legislation recognizes the governance of non-personal smart city data as an 'objective of general interest'. Therefore, initiatives that seek to implement collective governance of non-personal smart city data must start at the national legal level to ensure that they have a solid legal foundation. In its current state, it is not necessary to recommend changes to the EU legal order itself, as it is compatible with collective governance of non-personal smart city data, due to the Data Governance Act. Nevertheless, changes to EU competition law may, in particular, become appropriate if the decision-making capacity of NSCDCs becomes overly restrictive through future case law.

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Abstract

Governing Smart City Data as a Commons and the EU Legal Framework – An Inevitable Conflict?

Smart cities promise to provide a more efficient, economic, and sustainable future for the smart citizens that inhabit them. However, these smart cities are fuelled by a continuous stream of non-personal smart city data that is generated from the network of sensors that constitutes the city itself. The effects of sharing this data on the community are often overlooked, as they concern non-personal data. This extends to the EU legal framework where personal data is intensely regulated through the General Data Protection Regulation, while non-personal data has largely been left unregulated. Furthermore, the Open Data Directive establishes an obligation to automatically share non-personal smart city data. When combined with the often profit-oriented visions for smart cities that relegate the individuals within a smart city as consumers, a bleak vision for the future emerges. A citizen within a smart city generates an endless stream of smart city data, yet has little say in how that data is shared regardless of the impacts it may have on the local community generating it.

This thesis serves to challenge the assumption that the sharing of non-personal smart city data is without consequence for the local community that generates it. Moreover, this thesis aims to demonstrate that the governance of non-personal smart city data by the local community is not only necessary, but viable from a legal perspective. The primary research question of this thesis is to what extent is the EU legal framework compatible with the governance of non-personal smart city data through commons. In this regard, it was found that the governance of non-personal smart city data through a commons consisting of a local community would enable it to retake control of data sharing decisions by being outside of the scope of the Open Data Directive. The research question was further answered through three sub-questions, each exploring a different aspect of the legal dimensions of governing non-personal smart city data as a commons.

The first of these sub-questions sought to identify legal conflicts with the governance of non-personal smart city data as a commons. The first publication identified the need for a legal form to have ownership of non-personal data for such a commons and the potentially existential issue of compliance with EU competition law. Moreover, the need for an efficient and low-cost dispute resolution mechanism was found from the literature review. In regard to dispute resolution, the publication put forth the suggestion of utilizing arbitration to meet this critical need for dispute resolution within a commons.

The second sub-question explored the potential conflict with competition law and a commons governing non-personal smart city data. The second publication demonstrated that any such commons would be within the scope of competition law and would have to remain cognizant of the restrictions provided by the legislation. In particular, it was found that violations of both Articles 101 and 102 TFEU are possible when making decisions on sharing or pooling non-personal smart city data. Consequently, the thesis demonstrated the necessity to not only comply with EU competition law, but additionally to incorporate legal counsel into the decision-making of such commons.

Finally, the third sub-question examined the then newly introduced possibilities brought by the Data Governance Act to provide formal recognition for non-personal smart city data commons. The third publication identified data altruism organizations as being suitable for the purposes of such a commons and thereby recognizing their ability

to decide upon the sharing of non-personal data within the EU legal framework. Moreover, it was demonstrated that this would rectify the uncertainties surrounding the ownership or stewardship of non-personal smart city data.

Therefore, overall, it was found that the EU's legal framework is not incompatible with the governance of non-personal smart city data through commons. In fact, as demonstrated in the third publication, the Data Governance Act's data altruism organizations could be utilized to provide formal recognition within the EU legal framework for such commons. This represents a significant opportunity and a practical avenue of implementing non-personal smart city data commons. However, the findings on competition law indicate that there is a potential conflict that will overshadow the decision-making of such a commons until actual case law emerges.

Lühikokkuvõte

Targa linna andmete kui ühisomandi haldamine ja ELi õigusraamistik – vältimatu konflikt?

Targad linnad lubavad oma elanikele tõhusamat, ökonoomsemat ja jätkusuutlikumat tulevikku. Siiski toetuvad need targad linnad pidevale mitteisikuandmete voole, mida toodavad linna enda andmete kogumise võrgustikud. Andmete jagamise mõju kogukonnale jäetakse sageli tähelepanuta, kuna tegemist on mitteisikuandmetega. See kajastub ka ELi õigusraamistikus, kus isikuandmeid reguleerib rangelt isikuandmete kaitse üldmäärus, samas kui mitteisikuandmed on suures osas reguleerimata. Lisaks kehtestab avatud andmete direktiiv kohustuse jagada mitteisikuandmeid automaatselt. Kui seda kombineerida tihti kasumikesksete tarkade linnade visioonidega, kus elanikud taandatakse tarbijateks, terendab sünge tulevikupilt. Targa linna elanik toodab lakkamatult linnaandmeid, kuid tal on vähe mõjuvõimu selle üle, kuidas neid andmeid jagatakse, hoolimata nende võimalikust mõjust kohalikule kogukonnale, kust need pärinevad.

See doktoritöö seab kahtluse alla eeldused, justkui ei avaldaks mitteisikuandmete jagamine mõju neid tootvale kogukonnale. Lisaks püüab töö näidata, et mitteisikuandmete haldamine kohaliku kogukonna poolt ei ole mitte ainult vajalik, vaid ka õiguslikult teostatav. Töö põhiküsimus on, mil määral on ELi õigusraamistik kooskõlas mitteisikuandmete ühisomandina haldamisega. Selgus, et kui kohaliku kogukonna moodustatud ühisomand haldab mitteisikuandmeid, annab see võimaluse andmete jagamise üle kontroll tagasi võtta, jäädes väljapoole avatud andmete direktiivi reguleerimisala. Põhiküsimusele vastati kolme alaküsimuse kaudu, millest igaüks käsitleb mitteisikuandmete ühisomandina haldamise erinevat õiguslikku aspekti.

Esimene alaküsimus keskendus õiguslike konfliktide tuvastamisele, mis võivad tekkida mitteisikuandmete ühisomandina haldamisel. Esimene publikatsioon tõi esile vajaduse luua juriidiline vorm, mis võimaldaks omada mitteisikuandmeid, ning viitas eksistentsiaalsele probleemile – ELi konkurentsiõiguse järgimisele. Kirjanduse analüüsis leiti, et vajalik on tõhus ja madalate kuludega vaidluste lahendamise mehhanism. Vaidluste lahendamiseks tehti ettepanek kasutada vahekohtumenetlust, et rahuldada ühisomandis sellise mehhanismi kriitilist vajadust.

Teine alaküsimus käsitles võimalikke konflikte konkurentsiõigusega mitteisikuandmeid haldava ühisomandi kontekstis. Teine publikatsioon näitas, et selline ühisomand kuulub konkurentsiõiguse kohaldamisalasse ja peab arvestama seaduses sätestatud piirangutega. Eriti selgus, et ELi toimimise lepingu artiklite 101 ja 102 rikkumised on võimalikud, kui otsustatakse mitteisikuandmete jagamise või koondamise üle. Seetõttu näitas töö, et lisaks ELi konkurentsiõiguse järgimisele on vaja kaasata juriidiline nõustamine ühisomandi otsustusprotsessi.

Kolmas alaküsimus uuris andmehalduse määrusega kaasnenud uusi võimalusi mitteisikuandmete ühisomandile ametliku tunnustuse andmiseks. Kolmas publikatsioon määratles andmealtruismi organisatsioonid kui sobivad sellise ühisomandi tarbeks ja tunnustas nende võimet otsustada mitteisikuandmete jagamise üle ELi õiguskeskkonnas. Samuti näidati, et see aitaks lahendada ebakindlust, mis puudutab mitteisikuandmete omandit või haldamist.

Kokkuvõttes leiti, et ELi õigusraamistik ei ole vastuolus mitteisikuandmete ühisomandina haldamisega. Tegelikult võiks, nagu kolmas publikatsioon näitas,

andmehalduse määruse andmealturismi organisatsioone kasutada sellise ühisvara ametlikuks tunnustamiseks ELi õigusraamistikus. See kujutab endast olulist võimalust ja praktilist teed mitteisikuandmete ühisomandina rakendamiseks. Siiski viitavad konkurentsiõiguse järeldused võimalikule konfliktile, mis mõjutab sellise ühisomandi otsustusprotsessi seni, kuni ei kujune välja kohtupraktikat.

Appendix: Publications I–III

Publication I

A. Kajander (2022) Legal Perspectives on Smart City Data as a Commons, *International and Comparative Law Review* 22(2), pp. 7–26.

sciendo

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Legal Perspectives on Smart City Data as a Commons

Aleksi Kajander

Tallinn University of Technology, Estonia

Aleksi.kajander@taltech.ee

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Summary: Smart cities are purported to produce vast amounts of data of immense value, both commercially and from a governance perspective. The control and stewardship of this smart city data remains controversial, with concerns for the role of the individual smart citizens and the control they exercise over the data they generate. Elinor Ostrom's Nobel prize winning work on long-lasting and sustainable commons has been suggested as a solution, whereby the commons management principles would be applied to smart city data. This paper seeks to identify the current applications of Ostrom's commons to smart city data in literature, as well as explore their legal implications. Particularly, what legal challenges may arise from the smart city data commons, and how they could be addressed through legislative frameworks. The article aims to identify and highlight these legal challenges and thereby provide a legal perspective on the concept of smart city data commons.

Keywords: smart city, data commons, data, commons, law, ADR, GDPR, competition law, Ostrom.

1 Introduction

The smart city concept is set to transform the future of city living with vast and available data that promises to bring benefits to businesses and individuals alike. However, often smart city developments have been criticized as being 'corporate led' thereby catering more to the needs of the businesses rather than the citizens.

As a consequence, the application of the 'theory of the commons' based on Ostrom's Nobel prize winning work on common pool resources has been suggested as a solution to empower the local communities in respect to the smart city data generated around them. Ostrom studied long-lasting commons, and identified eight principles that were shared by such commons, which included self-governance, locally adapted rules, and low-cost conflict resolution mechanisms.[1] Therefore, if smart city data was to be treated as a commons, it could help

1 OSTROM, Elinor. *Governing The Commons*. Cambridge: Cambridge University Press, 1990, p. 90.

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counteract the perceived corporate led nature of smart city developments and re-empower the smart citizens of the future.

This paper utilizes a literature review to explore the question of what is the current state of the literature integrating Ostrom's theory of the commons to smart city data. Furthermore, besides the literature review, this paper will additionally aim to provide further development to the current theoretical framework integrating Ostrom's commons to smart city data from a legal perspective. This aspect will be explored through the secondary research question of what emerging legal issues can be identified from the literature reviewed. Therefore, the overall aim of the paper is to both establish the current state of the integration of Ostrom's commons theory to smart city data, and what emerging legal issues may be derived from therein.

2 Methodology

In order to answer the research question of what is the state of the literature which explores smart city data as a commons, the search terms were chosen to produce literature where the concept of the smart city interacts with notion of smart city data as a commons. Consequently, the search terms "smart city" (alternatively "smart cities"), "commons" and "data" were used to conduct the queries. Qualifying resources needed to have all three terms in either the title, abstract, or keywords. Considering the ubiquity of the term "data", resources were considered to qualify even if "data" was attached to additional terms, such as for example "big data" or ideally "data commons".

Two databases were used for the literature review itself, Scopus and the Web of Science, which have already been identified previously as appropriate sources for smart city related literature review research[2]. The conducted searches produced 23 results on SCOPUS and 8 on Web of Science. After removing duplicates, and resources which did not qualify based on the three criteria, and a lack of access, 13 results were included in the study.

Considering the meagre number of initial results, the keywords of each of the 13 qualifying articles were examined for the purposes of snowballing to identify additional literature. Through this process, three additional keywords that bore the most relevance were selected, "urban commons", "data commons" and "knowledge commons". Combining each of these with the existing keyword of

2 LIM, Yirang, EDELENBOS, Jurian, GIANOLI, Alberto. Identifying the results of smart city development: Findings from systematic literature review. *Cities*, 2019, vol 95. MEIJER, Albert, BOLIVAR, Rodriguez, Pedro, Manuel. Governing the Smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*, 2015, vol. 82, no. 2. PEREIRA, Gabriela, *et al.* Smart Governance in the context of smart cities: a literature review. *Information Polity*, 2018, vol. 23, no, 2. ZHENG, Chuanjun, *et al.* From digital to sustainable: A scientometric review of smart city literature between 1990 and 2019,' *Journal of Cleaner Production*, 2020, vol. 258.

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"smart city" and "smart cities" produced an additional 19 results. After removing duplicates and reading each of the articles to ascertain if they were relevant to smart city data commons, an additional six articles were included, bringing the total to 19.

Nevertheless, considering the relatively low number of results in the study as the interaction of smart city data and commons is arguably an emerging field, the literature review was conducted in accordance with Webster's and Watson's (2002)[3] method, whereby the lack of literature will be compensated by the author's own additional contributions to the theoretical framework. Therefore, this literature review's structure is two-fold, the first part examining the existing and identified literature and the second providing the author's own contribution to the theoretical framework from a legal perspective.

3 The Literature Review

3.1 Why the Commons?

The meaning of the term 'smart city' is notoriously difficult to provide a concise and uniformly acceptable definition[4], owing to the vast multidisciplinary body of literature that has examined smart cities from a variety of perspectives[5]. Nevertheless, for the purposes of beginning the discussion, a 'smart city' can be considered on a basic level as a city that incorporates information communication technologies to collect and communicate data that is then used for a variety of purposes such as improving efficiency and competitiveness[6]. The latter half of the definition is arguably where the disagreements over the meaning of a 'smart city' begin, as questions arise as to what purposes should this type of city be used for.

Against this backdrop, to begin to understand why Ostrom's commons theory became such an attractive prospect to include in the smart city discourse, it is necessary to first look at the criticism of what many perceived to be the dominant smart city vision being propagated. This vision can be described as 'corporate-led' whereby the focus is more on the economical benefits that could be reaped for businesses through smart city developments, which reduced the 'smart' citizen to the role of a consumer within a marketplace[7]. Cardullo and

3 WEBSTER, Jane, WATSON, Richard. Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, 2002, vol. 26, no, 2, p. 2.

4 KISALA, Magdalena. The Polish Experience in the Development of Smart Cities. *TalTech Journal of European Studies*, 2021, vol.11, no. 2, p. 49.

5 KNIEPS, Gunter. Internet of Things and the Economics of Smart Sustainable Cities. *Competition and Regulation in Network Industries*, 2017, vol. 18, no, 1, p.116.

6 ZOFCINOVA, Vladimira, CAJKOVA, Andrea, KRAL, Rastislav. Local Leader and the Labour Law Position in the Context of the Smart City Concept through the Optics of the EU. *TalTech Journal of European Studies*, 2022, vol. 12, no. 1, p. 10.

7 KNIEPS, Gunter. Internet of Things and the Economics of Smart Sustainable Cities. *Competition and Regulation in Network Industries*, 2017, vol. 18, no, 1, p. 825.

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Kitchin (2019)[8] explore this 'neoliberal' logic of smart cities in Europe, whereby in essence through civic paternalism, the elites make the decisions, while the actual participation of smart citizens is trivial or 'tokenistic' at best and they are limited effectively to their role as a consumer in a marketplace[9].

Consequently, to counterbalance this 'neoliberal' smart city vision, a smart 'sustainable' city alternative began to emerge. While facing a similar issue to the initial definition of a smart city, a smart sustainable city is arguably best defined by the Focus Group on Smart Sustainable Cities of the Telecommunication Standardization Sector of the International Telecommunication Union's 2014 definition for which they systematically analysed more than 100 definitions. This definition is as follows:

> "A smart sustainable city (SSC) is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operations and services, and competitiveness, while ensuring that it meets the needs of the present and future generations with respect to economic, social and environmental aspects"[10]

While the first part of the definition is similar to that which could be used for any smart city, the inclusion of "social" aspects besides the economic and environmental, is worth highlighting, as it serves as a counterpoint to the essentially overlooked social aspects of the tokenistic consumers of the corporate smart city vision. This concern regarding the social aspects, such as the role of the smart citizen in the smart city of the future is a somewhat unifying theme for much of the literature reviewed[11]. However, other terms such as the

8 Ibid.

9 Ibid.

10 KNIEPS, Gunter. Internet of Things and the Economics of Smart Sustainable Cities. *Competition and Regulation in Network Industries*, 2017, vol. 18, no, 1, p. 116.

11 IAIONE, Christian, DE NICTOLIS, Elena, SUMAN, Berti, Anna. The Internet of Humans (IoH): Human Rights and Co-Governance to Achieve Tech Justice in the City. *Law & Ethics of Human Rights,* 2019, vol. 13, no. 2, pp. 267–268, CARDULLO, Paolo, KITCHIN, Rob. Smart Urbanism and smart citizenship: The Neoliberal logic of 'citizen-focused' smart cities in Europe. *Environmental and Planning C Politics and Space*, 2019, vol. 37, no. 5, p. 815. CALZADA, Ivan, ALMIRALL, Esteve. Data Ecosystems For Protecting European Citizens' Digital Rights. *Transforming Government People Process and Policy*, 2020, vol. 14, no. 2, p. 136., MARQUES, Maria, *et al.* Contributions to Knowledge-Based Development Through Commons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, vol. 10, no. 1, pp 4–6, BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp. 207–208, BALESTRINI, Mara, *et al.* A City in Common: A Framework to Orchestrate Large-scale Citizen Engagement Around Urban Issues. In CHI. *2017 Chl Conference on Human Factors in Computing Systems*, Denver, Colorado USA, 2017, p. 2283, MONAHAN, Torin. Monopolizing mobilities: the data poltics of ride-hailing platforms in US Cities. *Telematics and Informatics*, 2020, vol. 55, p. 1, CALZADA, Ivan. (Smart) Citi-

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"humane smart city"[12] have been used to describe a similarly citizen orientated smart city vision, whereby the terminology is still in flux, even if the "sustainable smart city" appeared predominant in the literature reviewed. Regardless of the terminology, there is an underlying theme of restoring power to the individual community member or smart citizen. Therefore, it is not surprising that the literature reviewed supports a more "sustainable" vision of smart cities rather than the more corporate orientated model, regardless of the specific terminology.

Considering that the 'commons' as described by Ostrom in 1990 offers an alternative to both private or public orientated control of shared resources[13], it is perhaps not difficult to see the appeal of the theory in the context of the smart city discussion. For if the smart citizen is essentially a secondary concern as they are mainly a consumer, then a model which incorporates self-governance by the community rather than through private businesses or public administration, the latter being sometimes subject to the former in the context of smart cities[14], is logically an appealing choice.

3.2 Ostrom's Commons or Just Commons?

The importance of data for the future in the reviewed literature is evident, as the transformative power and importance of data for the future smart cities

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zens from Data Providers to Decision-Makers? The Case Study of Barcelona. *Sustainability,* 2018, vol. 10, no. 9, p. 2, DE LANGE, Michiel. The Right to the Datafied City: Interfacing the Urban Data Commons. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, p. 79, MUKHAMETOV, R, D. Collective Data Governance for Development of Digital Government. In IEE. *2021 International Conference on Engineering Management of Communication and Technology*, Vienna, Austria, 2021, p.3, GLOERICH, Inte, *et al*. The City as a License. Implications of Blockchain and Distributed Ledgers for Urban Governance. *Frontiers in Sustainable Cities*, 2020, vol 2, p. 5, LABAEYE, Adrien. Sharing Cities and Commoning: An Alternative Narrative for Just and Sustainable Cities. *Sustainability*, 2019, vol. 11, no. 16, p. 2, CARDULLO, Paolo. Smart Commons or a 'Smart Approach' to the Commons?. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, p. 86, ROTTA, Ribeiro, Jose, Mauricio, *et al*. Digital Commons and Citizen Coproduction in Smart Cities: Assessment of Brazilian Municipal E-Government Platforms. *Energies*, 2019, vol 12, no. 4, p. 2.

12 ROTTA, Ribeiro, Jose, Mauricio, *et al*. Digital Commons and Citizen Coproduction in Smart Cities: Assessment of Brazilian Municipal E-Government Platforms. *Energies*, 2019, vol 12, no. 4, p. 2.

13 OSTROM, Elinor. *Governing The Commons*. Cambridge: Cambridge University Press, 1990, p.18.

14 MOROZOV, Evgeny, BRIA, Francesca. *Rethinking the Smart City Democratizing Urban Technology*, New York:Rosa Luxemburg Stiftung, 2018, pp. 1,18.

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is almost universally acknowledged[15]. However, with data being the 'new oil'[16] naturally questions arise as to its ownership, stewardship, and distribution. The ubiquitous nature of data in the smart city environment has led to the suggestion that smart city data could be treated as a 'commons', as it is effectively generated by the community, whereby it is reasonable to suggest that it should be a common resource.

However, before data can be referred to as a commons, it is important to first understand the meaning of the term and the theory behind it. In itself, the English language term 'commons' refers to a resource which belongs to or affects the

15 CALZADA, Ivan. (Smart) Citizens from Data Providers to Decision-Makers? The Case Study of Barcelona. *Sustainability,* 2018, vol. 10, no. 9, p. 2., BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, p. 206., GUTSCHOW, Evelyn. Big Data-Driven Smart Cities: Computationally Networked Urbanism, Real-Time Decision-Making, and the Cognitive Internet of Things. *Geopolitics, History, and International Relations*, 2019, vol. 11, no. 2, p. 49, MONAHAN, Torin. Monopolizing mobilities: the data poltics of ride-hailing platforms in US Cities. *Telematics and Informatics*, 2020, vol. 55,p. 1., IAIONE, Christian, DE NICTOLIS, Elena, SUMAN, Berti, Anna. The Internet of Humans (IoH): Human Rights and Co-Governance to Achieve Tech Justice in the City. *Law & Ethics of Human Rights,* 2019, vol. 13, no. 2, p. 281, CARDULLO, Paolo, KITCHIN, Rob. Smart Urbanism and smart citizenship: The Neoliberal logic of 'citizen-focused' smart cities in Europe. *Environmental and Planning C Politics and Space*, 2019, vol. 37, no. 5, p. 821., CALZADA, Ivan, ALMIRALL, Esteve. Data Ecosystems For Protecting European Citizens' Digital Rights. *Transforming Government People Process and Policy*, 2020, vol. 14, no. 2, p. 136., MARQUES, Maria, *et al.* Contributions to Knowledge-Based Development Through Commons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, vol. 10, no. 1, p. 3., FAIRBURN, Sue, *et al* (2018), CAPE(Climate Anticipation Personal Environment): Constructing the CAAS-Wardrobe. In INTERNATIONAL ASTRONAUTICAL FEDERATION. *Proceedings of the International Astronatucial Congress 2018, IAC 2018-October*, Bremen, Germany, 2018, p. 1., DE LANGE, Michiel. The Right to the Datafied City: Interfacing the Urban Data Commons. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, pp. 71–72., MUKHAMETOV, R, D. Collective Data Governance for Development of Digital Government. In IEE. *2021 International Conference on Engineering Management of Communication and Technology*, Vienna, Austria, 2021, p.1., GLOERICH, Inte, *et al*. The City as a License. Implications of Blockchain and Distributed Ledgers for Urban Governance. *Frontiers in Sustainable Cities*, 2020, vol 2, p. 3., LABAEYE, Adrien. Sharing Cities and Commoning: An Alternative Narrative for Just and Sustainable Cities. *Sustainability*, 2019, vol. 11, no. 16, p. 3, CARDULLO, Paolo. Smart Commons or a 'Smart Approach' to the Commons?. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, p. 90., CHIEN, Herlin, HORI, Keiko, SAITO, Osamu. Urban commons in the techno-economic paradigm shift: An information and communication technology-enabled climate-resilient solutions review. *Urban Analytics and City Science*, 2022, vol. 45, no 5, p.1396.

16 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp. 206

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whole of a community[17]. The term is now frequently associated with the Nobel prize winning work of Elinor Ostrom, in her study of the governance of 'common pool resource'/'commons'[18]. As a result, there is a potential for confusion as the latter, Ostrom's commons, are often in practice referred to as just "commons", whereby it may not always be clear exactly what 'commons' is being referred to.

Marques *et al* (2021) in their exploration of the contributions to Knowledge-Based Development through commons theory in the context of data, provide an excellent summary of the theory of the commons as developed by Elinor Ostrom[19]. At its very core, the Commons theory is based on the principles that enable the social process of community management of a shared depletable resource[20]. Ostrom studied successful long-lasting commons and identified shared governance characteristics which ultimately formed eight generalizable principles[21]. Subsequently, the theory evolved from purely physical resources that were the subject of the initial study, such as fishing grounds, forests or irrigation to non-physical resources such as knowledge.

In this respect, Marques *et al* eloquently define the knowledge commons as 'common arrangements to overcome various social dilemmas associated with sharing and producing information, innovation and creative work'[22]. Naturally, there are significant differences for knowledge commons when compared to traditional commons, as they cannot be physically depleted like natural resources, as one's use of digital data does not prevent its use by another, and contrary to natural resources nothing is withdrawn from the resource but rather something (can be) added to it[23]. Therefore, considering how, for example scientific progress is based on incremental improvements based on previous knowledge, unlike with 'traditional' commons where overutilization is the primary threat, with knowledge commons, the threat is the opposite, which is to say undersupply[24]. Consequently, as Ostrom (2009) noted, data is considered a common good as it is both used collectively, and it brings benefits to society through innovation[25].

17 DICTIONARY.COM. *Commons.* [online] Available at: <https://www.lexico.com/definition/commons> Accessed: 11.10.2022.

18 EULER, Johannes. Conceptualizing the Commons: Moving Beyond the Goods-based Definition by Introducing the Social Practices of Commoning as Vital Determinant. *Ecological Economics*, 2018, vol.26, pp. 10–11.

19 MARQUES, Maria, *et al.* Contributions to Knowledge-Based Development Through Commons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, vol. 10, no. 1, p. 9.

20 Ibid, p. 9.

21 Ibid.

22 Ibid, p. 11.

23 Ibid, p. 12.

24 FRISCHMANN, Brett, MADISON, Michael, STRANDBURG, Katherine. Conclusion. In FRISCHMANN, Brett, MADISON, Michael, STRANDBURG, Katherine (eds.). *Governing Knowledge Commons*, Oxford:Oxford University Press, 2014, p. 474.

25 MARQUES, Maria, *et al.* Contributions to Knowledge-Based Development Through

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Considering the strong link to sustainability right from the beginning of Ostrom's 'commons' theory[26], it is unsurprising that the theory has found application in the smart sustainable city vision. This connection was evident in the literature reviewed as 11 of the 19 included articles either cite or discuss Ostrom's work directly[27], with 10 of the 11 additionally discussing or referring to sustainability[28].Therefore, it is evident how Ostrom's work continues to inspire and be relevant in the sustainable smart city discourse to this day.

However, while Ostrom's commons theory is intrinsically linked to principles such as sustainability and self-governance, it should not be presumed that any reference to 'commons' is necessarily a reference to the meaning that Ostrom's theory has given them. This is evident in the literature that was reviewed, as while 11 of the resources as mentioned reference Ostrom and her theory, the remaining resources either did not define the term 'commons' or provided an

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Commons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, vol. 10, no. 1, p. 4–5.

26 OSTROM, Elinor. *Governing The Commons*. Cambridge: Cambridge University Press, 1990, p. 59.

27 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp.208; CALZADA, Ivan, ALMIRALL, Esteve. Data Ecosystems For Protecting European Citizens' Digital Rights. *Transforming Government People Process and Policy*, 2020, vol. 14, no. 2, p.7; MARQUES, Maria, *et al.* Contributions to Knowledge-Based Development Through Commons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, vol. 10, no. 1, p. 36; IAIONE, Christian, DE NICTOLIS, Elena, SUMAN, Berti, Anna. The Internet of Humans (IoH): Human Rights and Co-Governance to Achieve Tech Justice in the City. *Law & Ethics of Human Rights,* 2019, vol. 13, no. 2, p.265; CHIEN, Herlin, HORI, Keiko, SAITO, Osamu. Urban commons in the techno-economic paradigm shift: An information and communication technology-enabled climate-resilient solutions review. *Urban Analytics and City Science*, 2022, vol. 45, no 5, p. 1391; BALESTRINI, Mara, *et al.* A City in Common: A Framework to Orchestrate Large-scale Citizen Engagement Around Urban Issues. In CHI. *2017 Chl Conference on Human Factors in Computing Systems*, Denver, Colorado USA, 2017, p.2283; DE LANGE, Michiel. The Right to the Datafied City: Interfacing the Urban Data Commons. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, p. 73; MUKHAMETOV, R, D. Collective Data Governance for Development of Digital Government. In IEE. *2021 International Conference on Engineering Management of Communication and Technology*, Vienna, Austria, 2021, p. 5; ROTTA, Ribeiro, Jose, Mauricio, *et al*. Digital Commons and Citizen Coproduction in Smart Cities: Assessment of Brazilian Municipal E-Government Platforms. *Energies*, 2019, vol 12, no. 4, p. 5; GLOERICH, Inte, *et al*. The City as a License. Implications of Blockchain and Distributed Ledgers for Urban Governance. *Frontiers in Sustainable Cities*, 2020, vol 2, p. 5; LABAEYE, Adrien. Sharing Cities and Commoning: An Alternative Narrative for Just and Sustainable Cities. *Sustainability*, 2019, vol. 11, no. 16, , p. 7.

28 Ibid except for MUKHAMETOV, R, D. Collective Data Governance for Development of Digital Government. In IEE. *2021 International Conference on Engineering Management of Communication and Technology*, Vienna, Austria, 2021.

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alternative definition. For example, in Monahan (2020)[29] commons in reference to urban roadways were defined as 'collectively owned resources that should, ideally, support public needs above all others'[30], which does not include any aspects of self-governance such as would be associated with Ostrom's commons.

On the other hand, on the next page[31] when discussing a 'data commons' that would be a shared pool of data, the concept of a 'common approach' to managing the data and that such a data commons would not be a 'big open lake and everybody can look at it' is mentioned[32]. Consequently, the latter definition is consistent with Ostrom's concept of a commons while the former is more consistent with the common dictionary definition of a shared resources, and as such both are correct uses of the term 'commons', even if such uses may lead to confusion.

This problem is not limited purely to the theoretical literature sphere, as demonstrated by Labaeye (2019) when reviewing 137 sharing case studies to examine which incorporate Ostrom's commons.[33] Out of the examined case studies, in 26 % (35 out of 137) an (Ostrom's) commons could be identified, where key principles such as collective management was present.[34] Consequently, even in reality if something is a shared resource, and therefore a commons in the ordinary sense, it does not necessarily translate to a commons in the Ostrom sense.

Therefore, the potential for confusion both in the literature and real-life when discussing 'commons' remains, and as such it may be difficult to distinguish between the two different meanings. While in some cases it is possible to establish from the context which meaning is intended, such as when the discussion of the commons is in the same paragraph as discussions of self-governance[35], this is not always the case as a definition is not always provided[36]. As a result, it

29 MONAHAN, Torin. Monopolizing mobilities: the data poltics of ride-hailing platforms in US Cities. *Telematics and Informatics*, 2020, vol. 55, p 5.

30 Ibid.

31 Ibid, p. 6.

32 Ibid.

33 LABAEYE, Adrien. Sharing Cities and Commoning: An Alternative Narrative for Just and Sustainable Cities. *Sustainability*, 2019, vol. 11, no. 16, p. *7.*

34 Ibid, p.13.

35 CARDULLO, Paolo. Smart Commons or a 'Smart Approach' to the Commons?. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, p. 825.

36 RODGERS, Morgan, *et al*. Data Commons to Support University-Wide Cross Discipline Research. In ASSOCATION FOR COMPUTER MACHINERY. *ACM International Conference Proceeding Series 3335198,* New York, United States, 2019, pp. 1–2; GUTSCHOW, Evelyn. Big Data-Driven Smart Cities: Computationally Networked Urbanism, Real-Time Decision-Making, and the Cognitive Internet of Things. *Geopolitics, History, and International Relations*, 2019, vol. 11, no. 2, pp. 48–54; KNIEPS, Gunter. Internet of Things and the Economics of Smart Sustainable Cities. *Competition and Regulation in Network Industries*, 2017, vol. 18, no, 1, pp.115–131.

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is unfortunate that such ambiguity is present as it may cause confusion in the discussion and as a result potentially cause sub-optimal conclusions to be drawn.

3.3 Data Commons – Open Data?

Data is a crucial component of the Smart City, as it is essentially both a product and a resource, with potentially immense value[37]. What to do with this 'new oil'[38] and how to distribute it is a contentious issue, with some smart city developments essentially exchanging data for infrastructure whereby large multinational companies acquire immense amounts of smart city data[39]. On the other hand, there are equally voices for opening up the data, which would additionally yield additional economical benefits that would be spread more equitably[40]. 'Open data' has emerged as a counter to the corporation-led smart city developments that would essentially result in 'surveillance capitalism' through data analytics[41], whereby open data would wrest the control of the smart city data from the technocratic to the democratic[42].

While there is little doubt that open data constitutes a commons in the ordinary meaning of the word, as it is quite literally a shared resource, a question arises if the same would be true for Ostrom's commons? In the literature reviewed, open data is mentioned in 15 of the 19 resources reviewed[43], which is

37 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, p. 206.

38 Ibid, p. 206.

39 MOROZOV, Evgeny, BRIA, Francesca. *Rethinking the Smart City Democratizing Urban Technology*, New York:Rosa Luxemburg Stiftung, 2018, p. 8–10.

40 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp. 206–207.

41 CALZADA, Ivan, ALMIRALL, Esteve. Data Ecosystems For Protecting European Citizens' Digital Rights. *Transforming Government People Process and Policy*, 2020, vol. 14, no. 2, p.134.

42 Ibid, pp. 136–137.

43 MONAHAN, Torin. Monopolizing mobilities: the data poltics of ride-hailing platforms in US Cities. *Telematics and Informatics*, 2020, vol. 55, pp. 1–9 CALZADA, Ivan, ALMIRALL, Esteve. Data Ecosystems For Protecting European Citizens' Digital Rights. *Transforming Government People Process and Policy*, 2020, vol. 14, no. 2, pp. 133–147; CALZADA, Ivan, ALMIRALL, Esteve. Data Ecosystems For Protecting European Citizens' Digital Rights. *Transforming Government People Process and Policy*, 2020, vol. 14, no. 2, pp. 813–830; KNIEPS, Gunter. Internet of Things and the Economics of Smart Sustainable Cities. *Competition and Regulation in Network Industries*, 2017, vol. 18, no, 1, pp. 115–131; BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp. 205–221; MARQUES, Maria, *et al.* Contributions to Knowledge-Based Development Through Commons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, vol. 10, no. 1, pp. 1–25; CALZADA, Ivan. (Smart) Citizens from Data Providers to Decision-Makers? The Case Study of Bar-

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unsurprising as open data has been heralded as bringing forth innovation and economic benefits in the smart city context[44]. Consequently, the expectation may be that open data should therefore be synonymous with the commons, both traditional and Ostrom's.

However, the literature reviewed does not necessarily support this view. On the one hand, the literature remarks about the negative effects of not sharing data, such as data monopolies[45] and the positive effects such as increased innovation and new services that can be developed based on openly available data[46]. On the other hand, the literature reviewed additionally highlights the downsides of open data for smart cities[47] and the aversion that private entities may have towards a truly open data which anyone could access[48].

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44 Marques, M., et al (2021) Contributions to Knowledge-Based Development Through Commons Theory, Using Data as a Common Good, Revista de Gestao Ambiental e Sustentabilidade, Vol 10 (1), p. 21; Beckwith, R., Sherry, J., Prendergast, D. (2018) 'Data Flow in the Smart City: Open Data Versus the Commons', in De Lange M, de Waal, M. (eds) The Hackable City, Singapore: Springer Singapore, p. 205.

45 MONAHAN, Torin. Monopolizing mobilities: the data poltics of ride-hailing platforms in US Cities. *Telematics and Informatics*, 2020, vol. 55, p. 2.

46 MARQUES, Maria, *et al.* Contributions to Knowledge-Based Development Through Commons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, vol. 10, no. 1, pp. 18, 21.

47 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, p. 207.

48 MONAHAN, Torin. Monopolizing mobilities: the data poltics of ride-hailing platforms in US Cities. *Telematics and Informatics*, 2020, vol. 55, p. 6.

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Beckwith *et al* (2018) provide a fascinating case study into the establishment and governing of flood data as a commons, whereby the community opted for a selective information sharing policy, as full open disclosure may have had (potentially unjustified) negative impacts on the community's property values[49]. In a different case study regarding collecting moisture data ('Dampbusters') from a community housing, the community opted for an open data approach except that data which was considered private[50]. Furthermore, the community appeared more comfortable in having the data held at a not-for-profit organization rather than the city council[51], which arguably is very much in the spirit of Ostrom's commons being an alternative to the private/public dichotomy.

Moreover, the *Dampbuster* case study reflected through the community's consideration for privacy, the concern that was raised by Calzada (2018), that liability risks may also be passed down to the end user of the open data who may not be able to bear such risks[52]. For example, should the community forgo the privacy concerns regarding the data they record as a part of their open data commons, in the EU they may arguably soon find themselves in conflict with the GDPR, due to the unauthorized sharing of personal data.

4. Emerging Legal Issues in Smart City Data

4.1 Personal Smart City Data

Personal smart city data may result in legal controversies as highlighted by Beckwith *et al* (2018) even if a person opts out and provides no data for the commons, they can nevertheless be affected by the sharing of such data[53]. As they illustrate in their example of flood information, which could affect the property value as it may be evident said property is on a flood prone area, even if no data was provided for or by said residence[54]. Especially in the EU legal environment, this could potentially lead into issues as the GDPR considers personal data as

49 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, p. 207.

50 BALESTRINI, Mara, *et al.* A City in Common: A Framework to Orchestrate Large-scale Citizen Engagement Around Urban Issues. In CHI. *2017 Chl Conference on Human Factors in Computing Systems*, Denver, Colorado USA, 2017, p. 2288.

51 Ibid.

52 CALZADA, Ivan, ALMIRALL, Esteve. Data Ecosystems For Protecting European Citizens' Digital Rights. *Transforming Government People Process and Policy*, 2020, vol. 14, no. 2, p. 9.

53 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp. 216–217.

54 Ibid, pp. 216–217.

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data that pertains to an identified or *identifiable* natural person, and for the latter it is not required that all data be from the same source[55].

A similar problematic scenario could be argued to exist in the case of the "Geluidsnet" (noise net) which recorded the noise pollution in the vicinity of the Schiphol airport in the Netherlands via a network of microphones set up in private houses.[56] Real-time data was produced of the surrounding area's noise pollution, which extending the logic described above, could reasonably affect the desirability of real-estate located near the measurement points.

Consequently, it is not difficult to picture a situation where a person who 'opted out' of the commons for flood or noise data posts an advertisement to sell their house, the data regarding the location of the house in an openly accessible data commons would now relate to that person's advertisement. This in turn could be used to determine the 'real' value of the house. Thus, the definition of 'personal data' under the GDPR would be fulfilled as the data is now 'relating to an identified or identifiable natural person'. As a result, liability under the GPDR could plausibly be attached to the data commons.

In the context of the EU legal framework, this may present an issue for the smart city data if they are formed into open data commons, as such data could equally come under the scope of the GDPR. Consequently, if anything this amplifies the importance of stewardship of the data by the community in which the data is generated, i.e. the smart city's inhabitants.

4.2 Non-Personal Smart City Data

Not all smart city data is necessarily personal data in the meaning of the GDPR. Non-personal smart city data outside the scope of the GDPR is largely unregulated, and it may give rise to legal issues, particularly in the field of competition law. As noted in Section 1.3., data may be made open, or it may be subject for more limited outside dissemination by the local community. Both options provide separate implications in terms of Ostrom's commons theory and the legal framework.

Ostrom discusses the prospect of knowledge as a commons, whereby through the lack of dissemination of knowledge an 'anti-commons' may result, which in turn will result in a depletion of 'data' and 'knowledge' in the future. The relationship between, data, information and knowledge is presented as follows, data is effectively a raw collection of values recorded, which can be organized to

55 PURTOVA, Nadezhda. The law of everything. Broad concept of personal data and future of EU data protection law. *Law, innovation and Technology*, 2018, vol. 11, no. 1, pp. 2–3.

56 DE LANGE, Michiel. The Right to the Datafied City: Interfacing the Urban Data Commons. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, p. 78.

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form information which in turn can be analysed to create knowledge[57]. To give a practical example of hypothetical non-personal smart city data, the number of unidentifiable cars passing a point every hour, information would be organizing that data into a table over a month, and finally, knowledge would be a published research article that considers the implications of the traffic pattern presented by the information.

The real-life example of Google's 'Waze' which makes available data on traffic congestion to the app-users for more efficient driving, demonstrates how non-personal smart city data has value.[58] Google then utilizes the provision of this data to build partnerships with cities.[59], thereby extracting value from data. Besides partnerships, it is evident how Waze-enabled navigation may translate to a competitive advantage for taxi drivers or logistics companies by minimizing time in congestion. Therefore, it is not unreasonable to suggest that if access to the data provided by Waze and similar applications is restricted through unfair business practices, it could have effects relevant from a competition law perspective.

However, Waze is still currently dependent on users to either have the app open or to manually insert notifications of traffic accidents and other relevant information[60]. Therefore, as it is dependent on many users to create the data, it is currently not arguably viable to begin restricting access to certain entities, however, in a smart city where sensors could produce the same data, the obstacle would not exist. Whereby, the competition law implications on the availability of data will arguably become increasingly important in the future.

Moreover, it should be noted that besides raw data, its further processing to information or knowledge is an effort that requires time, effort, and competence, and as a result the provision of it is a viable economic service even if it is based on publicly available 'free data'. The implication of this relationship is that whoever is able to accumulate the largest pool of data, especially if that data later becomes inaccessible to others, will potentially be in a position of power.

This position of power is especially relevant from a competition law point of view, for if it is accepted that the information or knowledge created from publicly available smart city data is valuable, then whoever has the most which is inaccessible to their competitors has an advantage as arguably larger datasets make for more reliable results. Consequently, it is reasonable to suggest that the

57 OSTROM, Elinor, HESS, Charlotte. *Understanding Knowledge as a Commons*. Massachusetts: MIT Press, 2007, p.8.

58 CARDULLO, Paolo. Smart Commons or a 'Smart Approach' to the Commons?. In CARDULLO, Paolo, DI FELICIANTONIO, Cesare, KITCHIN, Rob (eds). *The Right to the Smart City*, Bingley: Emerald Publishing Limited, 2019, p. 90.

59 Ibid.

60 GOOGLE. *How does Waze work?* [online] Available at <https://support.google.com/waze/answer/6078702?hl=en> Accessed: 11.10.2022.

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derivatives of smart city data will have commercial value and may be sold by enterprises engaged in this type of analysis business.

This derivative information and knowledge will then in turn give a competitive advantage to those businesses that buy it, as they are able to adjust their operations based on the information and knowledge they receive. Therefore, as a result, the availability of non-personal smart city data may have considerable financial outcomes. If a community, such as in the *Dampbusters* case opts to limit the availability of data, this obviously may provide an advantage to those businesses that have access to it over those that do not. If such access transactions are done unfairly such as through dissimilar conditions to equivalent transactions, the actions could be classified as anti-competitive behaviour from a legal point of view.

However, even with open data, anti-competitive outcomes may occur. For while the smart' city data generated by the sensor network in the 'smart' city is not finite, storage space likely is. Considering the vast amount of data that a hypothetical 'smart' city would generate, it is reasonable to suggest that as storage space is not infinite and storing all the data recorded would eventually become an unreasonable burden on the budget of the hypothetical 'smart' city or community. Therefore, the data may not be available forever.

The implication of this being that while the data is still available, it is accessible and thereby exploitable by all, however, once it is no longer available it is no longer 'common'. Hence, it becomes important from a competition law perspective that data that is no longer 'open', but rather is held by those entities that acquired it while it was, do not for example subject its sharing to unreasonable conditions. As that would limit for example the ability of newcomers to obtain sufficient quantities of data to compete with the existing market players, which in turn would have anti-competitive effects. Therefore, not even open data is free of legal concerns from a competition point of view, and as such if non-personal smart city data is shared openly in a commons, these considerations must be adequately addressed.

4.3 Conflict Resolution and the Commons

The sharing or not sharing of smart city data is liable to cause conflict, which will therefore require an effective means of conflict resolution. This concern is reflected in Ostrom's original eight principles which relate to dispute resolution, namely low-cost as well as rapidly accessible conflict resolution and graduated sanctions for those who abuse the commons[61].

Considering that conflict resolution, or the lack of a suitable method thereof, is not mentioned frequently in the literature reviewed, in fact it is only discussed

61 OSTROM, Elinor. *Governing The Commons*. Cambridge: Cambridge University Press, 1990, p. 90.

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notably in two of the reviewed resources[62]. As noted by Balestrini *et al* (2017) in the *Dampbusters* case study community projects often fail due to a lack of conflict resolution[63], and therefore it is a significant problem to overcome for the data commons as well, due to the above considerations about the impact and reach of the data. In the *Dampbusters* case study, the community utilized a democratic and transparent decision-making approach, which for that particular case was sufficient for a successful project, however, should there have been prolonged and heated conflicts, it is arguably unlikely they would have been able to be solved via open debates and voting alone. Similarly, although framed as the questions about data ownership and who can make the final decision, *Beckwith* (2019) highlights the key questions that conflict resolution for a data commons needs to be able to answer equitably and reliably such as whose values are more significant, those who stand to gain or those who stand to lose from the sharing of the data[64].

Therefore, as these questions are unanswered in the reviewed literature, it is not unreasonable to conclude that while some of Ostrom's commons principles are better implemented, the conflict-resolution and graduated sanctions principles are not. Consequently, these two make for a fertile foundation for future research. Based on Ostrom's original theory and the above literature reviewed, the author would suggest that the conflict resolution method ought to be a solution that is not strictly in the private-public dichotomy and as such an alternative just like Ostrom's commons.

Arguably one potential method could be (Iocal) arbitration whereby two opposing parties each select an arbitrator and those two arbitrators select a public administration official to be the third arbitrator. In such an arrangement, both the private and public sides would be represented as well as the communities, as it is likely that business interests may be in a dispute with the community over smart city data, and as such the tribunal would represent the businesses, the community, and the local governance through its three arbitrators, thereby equitably representing all three.

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62 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp. 208; BALESTRINI, Mara, *et al.* A City in Common: A Framework to Orchestrate Large-scale Citizen Engagement Around Urban Issues. In CHI. *2017 Chl Conference on Human Factors in Computing Systems*, Denver, Colorado USA, 2017, p. 2291.

63 BALESTRINI, Mara, *et al.* A City in Common: A Framework to Orchestrate Large-scale Citizen Engagement Around Urban Issues. In CHI. *2017 Chl Conference on Human Factors in Computing Systems*, Denver, Colorado USA, 2017, p. 2291.

64 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. Data Flow in the Smart City: Open Data Versus the Commons. In DE LANGE, Michiel, DE WAAL, Martjin. (eds). *The Hackable City.* Singapore: Springer Singapore, 2019, pp. 218–219.

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For such an arrangement to work however, the legal framework would have to allow for such a dispute resolution mechanism and likely the existing solutions such as institutional arbitration may be too expensive to be considered low-cost enough for the community. The necessity of the dispute resolution being low-cost cannot be overstated as it will have to be in congruence with a regime of graduated sanctions, whereby a dispute resolution system that is expensive but produces only graduated sanctions is likely to fail or not be used if the cost of using such a system would outweigh the benefits.

4.4 Legal implications of Smart City Data as a Commons

Even from the limited amount of literature reviewed that discusses smart city data and commons, numerous legal controversies and challenges are already identifiable. In this second section, these were rudimentarily divided into the categories of personal data, non-personal data, and conflict resolution, although this represents only a brief glimpse at the extent of the challenges that current legal frameworks may plausibly face. Therefore, further research ought to be directed at identifying and further exploring the legal challenges highlighted in this paper and uncovering those that remain yet to be uncovered.

Further research is especially important as already some of the legal challenges highlighted, if unaddressed, are liable to prevent the formation of effective and sustainable smart city data commons. For example, as identified, a lack of localized low-cost conflict resolution represents an existential threat to the sustainability over time of any potential smart city data commons, as the literature has demonstrated that such shortcomings may result in the collapse of the commons in question. Furthermore, without an understanding of the implications of sharing information, considerable legal liability may attach to smart city data commons through inadvertently infringing the provisions of the GDPR, which as noted in section 2.1., reaches far and wide. Similarly, the decisions made regarding smart city data in the commons may have widespread effects on economies and as such the competition law concerns that may arise, must be understood to ensure that the EU's envisioned Digital Single Market[65] is able to utilize the vast amount of data without creating an unfair competition environment which may negatively cascade through Member State economies. Consequently, the recognition and addressing of these legal challenges in the context of smart city data commons is crucial for the establishment of policies for long-lasting, successful, and sustainable smart city data commons.

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65 EUROPEAN COMMISSION. *Communication from the Commission to the European Parliament, The Council, the European Economic and Social Comittee and the Committee of the Regions – A Digital Single Market Strategy For Europe*. [online] Available at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0192&from=EN> Accessed: 11.10.2022.

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5 Conclusions

The appeal of Ostrom's commons in regard to smart cities arguably stems from the need to uncover an alternative to the neoliberal smart city vision, in the form of a more inclusive smart sustainable city. This alternative sustainable smart city addresses the perceived need to re-empower individuals and communities, that were at risk of being ignored in a primarily business-driven neoliberal smart city vision, to which Ostrom's commons that emphasized self-governance of local communities represents an enticing solution. However, the literature incorporating Ostrom's commons theory to smart city data in particular is still few and far between. This is further exacerbated by the ambiguous use of the term 'commons' as it may refer to either Ostrom's commons or its general meaning, and in some cases, it is unclear to which it refers to altogether.

Furthermore, the incorporation of Ostrom's commons principles to smart city data is still rather in its early stages, as while some principles such as self-governance are prominently featured, others such as effective and low-cost conflict resolution and graduated sanctions are essentially ignored. Moreover, what the dissemination and availability of smart city data should be is largely still up for debate, as it is evident that smart city data in a commons need not necessarily be synonymous with open data. In this regard, the reviewed literature provided a concrete example in the *Dampbusters* case study, where it was clear that while the local community desired to share their data, they did not wish to do so openly and desired a degree of restriction in access.

However, what is evident from the literature reviewed, is that there several emerging and underlying legal issues that must be addressed by the legal framework moving forward if smart city data is to be governed in accordance with Ostrom's commons theory. These cover a wide variety of fields, such as data privacy, competition law, and conflict resolution. Consequently, future research ought to be directed towards these identified issues in order to explore in more detail the ability of current legal frameworks to cope with the challenges or, what changes may be necessary for smart city data to be governed as a commons in the Ostrom sense.

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Smart City Data Commons and EU Competition Law – A Conflict in the Making?

Aleksi Kajander

Tallinn University of Technology, Department of Law, School of Business and Governance, Estonia

Thomas Hoffmann

Tallinn University of Technology, Department of Law, School of Business and Governance, Estonia

Abstract

Open data has been heralded as bringing great benefits to businesses and individuals alike in the EU, enabling the emergence of a data agile Europe and a society empowered by data. However, such arrangements are far from being free of disadvantages, especially for the citizens of smart cities. If the data generated by smart cities is made open almost by default, there is a serious risk of data disenfranchisement for the smart citizens, who may be negatively impacted by the publication of even non-personal smart city data. Consequently, Ostrom's commons have been considered as a possibility to re-empower smart citizens in regard to their data through self-governance. However, should smart citizens decide to make data available only to select users, they could potentially run into a conflict with EU competition law. Potential sources of conflict include violations of Articles 101 and 102 of the TFEU, through decisions made in the context of the self-governing smart city data commons. Consequently, this paper seeks to identify the potential conflicts between managing non-personal smart city data as a commons and EU competition law.

Keywords
Smart city, Data, Commons, Ostrom, Competition law, European Union,

JEL Classification
K21, L86, 034, R38, D86, H83

Introduction

The EU's 'European strategy for data' contains a vision for the future, where the availability of data enables both the private and public sector to make better decisions largely through open data (European Commission, 2020), for the availability of data is the 'lifeblood' of the hoped for economic development, and as such the EU's legal framework has already been transformed to meet this vision (European Commission, 2020, p. 4). Examples of this include the General Data Protection Regulation (GDPR) intended to build digital trust, as well as legislation aimed at the availability of data, such as most recently the 2022 Data Governance Act, the 2018 Regulation of the free flow of non-personal data (FFD) and the Open Data Directive. Furthermore, competition law is set to play an important role in the transformation, as the strategy noted the need to examine the competition law effects of large-scale data accumulation and data-access or sharing remedies (European Commission, 2020, p. 14).

This latter development is primarily aimed at Big Tech companies, as noted in the strategy itself, which accumulate and own vast amounts of data and as such hold considerable bargaining power (European Commission, 2020, p. 14). Indeed, against this development, the focus on open data appears to be the logical solution, for if data availability is maximized, it should enable competitors to enter the market and reduce the bargaining power of the 'Big Tech' companies, thereby reducing the distortion to the market. However, underneath the considerations for the data accumulation of 'Big Tech' and the drive for open data lies the risk of ignoring the effects which open data policies may have on the individual citizen, especially those who reside in smart cities.

While many smart city definitions exist, arguably a common underlying thread is that any city can be considered a smart city as far as it incorporates information communication technologies to collect and communicate data that is used to improve its efficiency and competitiveness (Zofcinova, Cajkova, and Kral, 2022, p.10). Consequently, the individual smart citizen (Fernández-Montesinos, 2020) inhabiting such a city will generate a considerable amount of data that will be captured by the surrounding sensors, which will either trigger legal transactions (for instance in form of oracles within smart contracts, Hoffmann, 2019, p. 168) or be collected for yet undisclosed purposes – but either way it will have considerable commercial value. However, often the smart citizen is reduced to the role of a consumer within a marketplace with little opportunity to step outside their intended role and actively

Corresponding author:
Aleksi Kajander, Akadeemia tee 3, 12611, Tallinn, Estonia
Email: aleksi.kajander@taltech.ee

participate in for example the management of the data (Knieps, 2017, p. 825).

This type of smart city model can be called the 'neoliberal' or 'corporate-led' model, which arguably describes the EU strategy for data. Even though this strategy refers to transparency, protection and oversight of personal data in various contexts, its main objective is fostering businesses and economic benefits generated from the availability of data (European Commission, 2020, pp. 4-5). This also implies individual rights given to citizens, which are viewed through the lens of competition benefits (Ibid, 2020, p. 10). Notably absent from the strategy are any collective rights for smart citizen to be able to decide what is done by the non-personal data that they generate.

As a counterbalance to the 'corporate-led' smart city model, the 'sustainable smart city' or 'humane smart city' models suggest emphasizing and empower the role of the individual smart citizen (Kajander, 2022, pp. 10-11). As a part of these alternative models, the incorporation of data as "commons" in terms of Ostrom's theory (Ostrom, 1990, p. 188) has been suggested to provide a true alternative to data management through private businesses or public institutions by the incorporation of self-governance (Lange, 2019, p.11). Knowledge commons have been defined as the common arrangements intended to overcome the social dilemmas arising from the sharing and producing of information (Marques et al, 2021, p. 11). While it is apparent that personal data can result in social dilemmas, it is already extensively governed by the General Data Protection Regulation (GDPR) in the EU, and as such citizens are already empowered regarding it. However, EU citizens arguably have negligible control over non-personal data. As non-personal smart city data nevertheless can impact the lives of smart citizens considerably, not to mention create social dilemmas, knowledge commons are arguably a fitting potential solution to its management and as such will be the focus of this paper.

However, with such self-governance arises the possibility that the data may not be made available for all, which could bring such ideas for data commons to a conflict with the EU legal framework. A decision to not share smart city data with certain entities that is made by a smart citizen common could put them in breach of EU competition law - for example of Article 102 (c) TFEU by applying dissimilar conditions to equivalent transactions. While this premise may sound initially far-fetched, as many of the more readily identified competition concerns surround the 'Big Tech' companies and their dominance of the market, the market power of smart city data commons (SCDC) could be considerable in the future. Their data governance actions could thus plausibly attract competition law attention, which may amount to an obstacle for the introduction or development of such citizen governance within the framework of EU competition law. This paper therefore aims to identify the potential conflicts between SCDC for non-personal data and EU competition law. Furthermore, the paper intends to outline the implications of this potential conflict with competition law on the possibility of introducing commons-orientated smart city data governance in the EU.

Literature Review

Non-Personal Smart City Data and the Need for Commons

The EU's strategy for data is centered around the availability of data which promises to be the 'lifeblood of economic development' enabling improved productivity and resource efficiency (European Commission, 2020). The strategy goes as far as to state that data is an 'essential resource' for start-ups and small and medium-sized enterprises (Ibid, 2020). Consequently, the free movement and sharing of data is essential for the vision of the EU for a 'data-agile' economy. However, that data must be obtained from somewhere, one such place being (future) smart cities' data sharing infrastructures, which produce and share an abundance of both personal and non-personal data through their sensors.

This smart city data, which can be defined as data generated and derived from the ICT infrastructure that constitutes a smart city (D'Ignazio et al, 2019, p. 133), will largely be created by the action and behaviour of individual smart city's residents. The abovementioned EU vision for data arguably assumes the smart citizens' consent to share all the data they generate whilst inhabiting a smart city as a forgone conclusion. This is reminiscent of the criticism of the 'neoliberal' model for smart cities where the citizens are passive data providers that form the 'raw material for algorithms that can be turned into commodities (Calzada, 2018, p. 6).

This highlights an important overshadowed aspect of the transformation to a single European data space and the data agile economy - the role, conditions, and willingness of the citizens to function as data donors. While it is not entirely fair to state that the citizens' perspective is not addressed in the EU's strategy for data, arguably it amounts to lip service to the idea of actually empowering smart citizens. This is demonstrated by the EU's own vision in 'empowering' citizens which has a twofold focus - data mobility to foster competition and protection of privacy.

The first point is exemplified by the focus on Article 20 of the GDPR in the strategy which provides consumers the ability to change service providers easier by migrating their data, and thereby 'fostering competition'. Secondly, even the privacy concerns are primarily cantered around economic benefits from better service and management of one's own data in the personal data economy (European Commission, 2020, p. 10). What is absent from both these concerns is the collective ability of smart citizens to decide what happens to the data that they generate by inhabiting a smart city. Arguably, the vision for 'empowering' citizens in the EU's strategy for data is in line with the

'neoliberal' smart city vision of a consumer with a tokenistic ability to manage their personal data. The collective management of non-personal data by smart citizens is not a consideration in the EU's strategy for data, instead there is a presumption that such data should be automatically shared in accordance with the Open Data Directive and the Free Flow of Non-Personal Data Regulation. Consequently, the ability of citizens to collectively oppose the sharing of certain non-personal data sets is arguably limited to non-existent.

Nevertheless, in the EU legal framework, it may be argued that there is no need for citizens to be able to govern their non-personal data, as they are adequately protected by the GDPR. This impression can, however, be deceiving, despite the GDPR extending protection to 'any information relating to an identified or identifiable natural person', which would seem to imply that if the data has any bearing on an individual directly, that individual will have control over it. Indeed, the scope is so broad that there have been arguments that it is too wide, and that essentially all data could amount to personal data in certain contexts - including the weather (Purtova, 2018, pp. 2-3). This argument was somewhat strengthened by the Breyer case where the CJEU found that personal data includes data, which by itself does not identify a person, but if additional data can lawfully be acquired that will identify the individual, then the initial data where the subject is not identified could be considered personal data, at least for dynamic IP addresses (El Khoury, 2018, p. 170). This in turn could be argued to extend the scope of the GDPR as it could, in theory, transform initially seemingly non-personal data to personal data based on the future availability or existence of additional information that would make the data relate to an identifiable individual. Nevertheless, until the CJEU confirms this argument regarding the scope of the GDPR, it cannot be truly relied upon, and as such this paper will use the conventional approach to personal data, whereby data that does not indirectly or directly relate to an identifiable person will be considered non-personal.

However, it is evident that non-personal data is not free of consequences, even though it does not directly relate to any identified or identifiable person, and therefore there exists a need for individuals to be able to govern its dissemination. An example of this is case study by Beckwith et al on the commons created to manage flooding data by local residents (Beckwith, Sherry and Prendergast, 2019). The residents felt that a full release of the data could result in potentially unjustified consequences for the homeowners in the area, and as such opted for a strategy of limited dissemination (Ibid, 2019). Under the current interpretation of the GDPR, the flooding data would be classified as non-personal data as it does not relate to any identified or identifiable person.

Nevertheless, as demonstrated by the residents' concerns, its disclosure could have significant implications for them. Furthermore, it is evident that the data would need to be managed collectively by the affected community, as the data will not impact only those who collect it, but everyone in its proximity, for even if one resident does not record data but their neighbours do, the implications of the data would extend to those who 'opted out' of collecting the data. Moreover, these effects may not be felt immediately, but for example only when an individual attempts to sell their house, whereby the data would hang above them like a modern sword of Damocles, having the potential to fall on the residents and impacting them negatively during future circumstances. Consequently, there is arguably a clear and convincing case for non-personal data to be managed collectively by those affected by it, which in the case of a smart city would be its citizens.

Moreover, this necessity is arguably heightened in the case of a smart city, which increases the number of data points that can be recorded (Madison, Sanfilippo, Frischmann, 2023, p. 12). Therefore, unlike in the flood data example, there is not just the impacts of releasing one type of data to consider, but the collective effect of multiple different types of data. It is logical that as even one type of data can result in social imbalances, then multiple types of different data are almost certain to result in greater and more numerous social dilemmas. The case of real-time open traffic data through Waze demonstrated the emergence of various social dilemmas, such as the efficiency of traffic versus the safety and comfort of residential areas (CBS News, 2014). The residents of affected areas lacked the means to control the conditions for sharing such data, which a knowledge common as the common arrangements intended to overcome the various social dilemmas that result from the sharing and producing of data (Marques et al, 2021, p.11), would provide for the area. Therefore, the governance of non-personal smart city data as a knowledge common is not only an appropriate solution, but a necessity.

The above example demonstrates several key points. Firstly, non-personal data has the power to impact the lives of individuals considerably. Secondly, smart city non-personal data may be undesirable to be made public, especially in real-time, owing to its power to impact citizens. Therefore, non-personal data has the ability hang like a modern sword of Damocles over the residents of an area, whereby its impact may be felt immediately such as with Waze's real-time traffic data or it may be felt further in the future as the residents in the flood plain example feared. Consequently, smart citizens have a legitimate reason to be able to govern the release of such 'data of Damocles'.

Hence, there is a situation that calls for the smart citizens to be able to govern the data they generate in the context of a smart city. In this respect, Ostrom's commons have been suggested as a possible solution to this governance conundrum, especially as the commons framework is well-suited to data (Raymond and Kouper, 2023, p. 58). The commons represent an alternative to either private or public governance of a resource that is subject to social dilemmas (Marques et al, 2021, p. 11). As noted above, even non-personal data is subject to social dilemmas as

it may hang over the populace like a modern sword of Damocles, whereby arguably there is a necessity for the community to decide to which extent are they willing to accept such risks from the sharing of data. Furthermore, experience has already demonstrated that public authorities are often incapable of resisting the private sector's offers for providing smart city infrastructure in exchange for the data (Morozov and Bria, 2018, p. 18), which disenfranchises the citizens. Consequently, it is arguably necessary to empower citizens, in regard to not only their personal data, but additionally their non-personal data, which can be achieved through the incorporation of SCDCs that are self-governed and able to decide the conditions for sharing the data generated by their smart city.

Methodology

A smart city data common (SCDC) is unlikely to attract any competition law controversy as long as it follows an 'open data' policy, whereby the data is made available equally to all interested parties. However, the purpose of a commons is the self-governance of the resource, the value of which lies in the ability to make meaningful choices, including making it available only to certain users. Hence, for a SCDC to be meaningful, it must be able to deny access to the valuable smart city data.

However, as the commons would be the sole gatekeeper to the data, conceivably, at least prima facie, its decisions could, in some cases, potentially be characterized as an abuse of dominant position under Article 102, as the commons effectively holds a data monopoly. Consequently, this paper will use existing caselaw to determine whether it is likely that SCDC could fall afoul of Articles 101 and 102 of the TFEU.

The Legal Form of Smart City Commons

Before either TFEU article can be discussed, the practical question of what legal form would a SCDC actually take has to be addressed. The importance of this question lies in establishing whether a SCDC as an entity would even be within the scope of EU competition law. The provisions of EU competition law are targeted towards 'undertakings'. This is demonstrated succinctly by Article 102 of the TFEU, whereby the provision applies to 'undertakings', that are in a 'dominant position' which has the capacity to 'affect trade between Member States'. Consequently, for SCDC to be in the scope of EU competition law, firstly they must be an 'undertaking'. Secondly, whether they are captured by Article 102 will depend on whether they can be characterized as being dominant and if is a potential effect on the trade between Member States. Similarly, Article 101 applies to 'undertakings' or 'associations', hence, for an entity to be in the scope of EU competition law it must be an undertaking.

The forms of 'traditional' commons that Ostrom originally studied, such as the collection of fishermen families in Alanya, Turkey were rather informal from a legal point of view, with the management of the fishing grounds being best described as a collection of agreed rules among the small number of fishers absent any particular legal form (Ostrom, 1990, p. 188). The commons in Valencia did employ a pseudo-court without lawyers to settle water disputes for the autonomous irrigation communities (Ibid, p. 71), however, these structures are far from the legal forms that one would encounter in a business register. However, in the more formal environment of a city, such informal collectives will not be viable, especially if they are to be vested with the ability to govern data, and therefore arguably they must have a defined legal form. Commons in urban settings have already taken the form of not-for-profit associations (Balestrini et al, 2017, p. 2288), and trusts (Chyi and Wu, 2023, pp. 85-86), whereby depending on the national laws the exact legal form may vary based on the available national options. However, it is evident that a SCDC must have some legal personality and be registered in some form, be it as a trust or a not-for-profit association.

Hence, while the exact legal form a SCDC may vary country to country, the scope of EU competition law is arguably broad enough to encompass all the variations. As the term "undertaking" itself is not defined within the TFEU, the case law of the Court of Justice of the European Union is used to define the term (Okeoghene, 2005, p. 213). In the judgement in Höfner, 'every entity engaged in economic activity, regardless of the legal status of the entity and the way it is financed' is considered an undertaking under EU competition law. Hence, it is irrelevant what legal form the entity takes, that is to say, a private company, a not-for-profit association, or something else in terms of determining whether the entity is covered by EU competition law. Furthermore, its source of financing is irrelevant, rather what is important is whether it engages in 'economic activity', which as the subsequent caselaw has demonstrated, can be occasionally difficult to define (Van der Gronden, 2018, p. 199).

'Economic activity' is defined by the CJEU as 'the offering of goods and services on the market', which while concise is somewhat unhelpful as it is effectively circular owing to the use of the term 'market' which is essential identical to the term 'economic' (Ibid, 2018). The CJEU has further considered that an essential part of 'economic activity' is competition, i.e. that even if there is no seeking of profit but the providers of the good or service are in competition with each other, the activity is to be considered economic (Ibid, 2018, p.200). This is arguably somewhat problematic in the commons context, as in the case of MOTOE the Court considered that even if motorcycle competitions did not seek to make a profit, their survival depended on outperforming their competitors. This raises a potential problem in the commons context, if the survival of a community association intended to self-govern data is dependent on any form of success to survive. While it is difficult to argue in the abstract conclusively either way,

doubts could be raised as to whether a community would stop collectively self-governing their data if they are 'outperformed' by other SCDCs, or if their commons was not generating income. Alternatively, it could be argued that if a SCDC does not share its data competitively compared to other commons, it will be a less desirable location for businesses, which in turn will reduce tax revenues, employment opportunities, and ultimately the standard of living, whereby it is in the commons' interest to be 'competitive'. Therefore, it is not inconceivable that the economic activity criteria would be fulfilled by a SCDC.

Another significant issue in the application of competition law is the definition of the (data) market. CJEU case law has established that 'hypothetical competition' is sufficient, which is to say that a service 'could be supplied in competition on the marketplace' for that to activity to be considered economic in nature (Sauter and Schepel, 2010, p. 82). The data 'market' for smart city data may be characterized in various ways. Firstly, it is necessary to recognized that a SCDC is most likely to be defined by a geographical scope, i.e. it will include the natural persons residing in the area covered by the smart city's sensors. Consequently, the commons would be able to determine the governance of the data in that geographical area, which is to say, they would essentially have a natural data monopoly over the city they self-govern.

Therefore, in a narrow definition of a data market, that of the city itself, there cannot be any competition on the market as there are no alternatives, at least for the data generated through the smart city sensors the commons governs. Consequently, any downstream market products that are dependent on such data will be entirely at the mercy of the commons' decisions as they effectively hold a natural monopoly and therefore depend on it for data access. In this regard, there would be no competition on the market, and as such the commons' would not have to compete for survival.

However, if the market scope is broader, that is to say for example the data market of a specific country that encompasses many separate SCDCs, such as in the case where each city would have a commons, then it could be argued that the commons is competing with other commons. Similarly, there could even be intra-smart city competition if different blocks of the city are governed by separate commons. Thus, it could be argued that the commons are competing among each other, for if data is the 'lifeblood' of the economy, then those smart cities that are most willing to share the data will also attract the most businesses, which in turn ensures their survival. This in turn incentivizes competitive behavior in offering the smart city data, as not doing so could compromise the future of the commons and the area it covers.

This will naturally scale up if examined on an EU-level, where the data sharing practices of different EU MS will similarly impact the economic success of the Member States. The larger definition for a data market and the ambition for a single market for data contained in the EU strategy on data would appear to be the most likely focus taken by the CJEU, especially as there is a requirement that the trade between MS could be affected for EU competition law to apply. Hence, it is clearly not inconceivable that the activities of the commons could be classified as fitting the concept of 'economic activity', and as such would be within the scope of EU competition law. Naturally, it will be for the CJEU to make a final determination, however, based on the existing case law and the concept of the SCDC, it seems reasonably possible that such commons would be in the scope of competition law.

Consequently, it is evident that there is a reasonable possibility that SCDCs would be within the scope of competition law, and as such may be subject to conflicts with the EU's competition law framework. Considering the natural monopoly like position and absence of substitutes, violations of both Article 101 and 102 of the TFEU are entirely plausible.

Results

Violations of Article 101 TFEU

The possibility of self-governance by a commons of smart citizens in a smart city brings with it plausible scenarios under which a commons or group of commons could violate EU competition law. As was established above, a SCDC can be considered an undertaking in the EU competition law sense, whereby the actions of a commons are within the scope of competition law. Consequently, attention must be turned towards the plausible scenarios in which violations of Article 101 of the TFEU could occur from decisions made by a commons regarding the sharing of their smart city data.

It is not inconceivable that a SCDC for one city would pool their data with another city, in order to improve its value, by creating a larger common pool of data. This could very well take place across EU Member State borders, such as in the context of the proposed FinEst Twins which seeks to create a cross-border smart city centre of excellence between Tallinn and Helsinki (Soe, 2022, p.3). As noted earlier, for EU competition law to be relevant, the infringement must have the potential to affect trade between Member States, whereby a cross-border smart city commons' decisions would definitely qualify. In the context of Article 101 TFEU decisions by commons that pool data together and agree to common conditions for the sharing or selling would be relevant. Such decisions could at least prima facie be considered to be agreements between undertakings that may restrict or distort competition within the internal market, in the meaning of Article 101 TFEU.

However, it is worth noting the purpose behind Article 101. As stated in the Guidelines for Vertical Agreements for Article 101 TFEU, Article 101 is to protect the consumers from agreements between undertakings, vertical or horizontal, that distort competition to the detriment of consumers. As a smart city commons would be constituted from the natural persons who live within the smart city and thereby generate the data and collectively self-govern via the commons, therefore it is largely, if not entirely, governed by consumers. Although it must be noted that EU competition law, unlike consumer protection law, equates customers to consumers, which includes businesses in addition to natural persons, in order to avoid a cumbersome process to trace every competition law breach's effect to the final natural person level (Robertson, 2018, p. 40). Nevertheless, arguably the ultimate object of protection is the same i.e., natural persons.

Consequently, it is a perplexing notion that decisions taken by what is essentially an association of residents (being data generators and consumers simultaneously) may be subject to legal control through competition law in order to protect themselves from the detriment of their own decisions. This is particularly fascinating as considering that arguably the majority of the potentially detrimental competition effects would be felt within the geographical area of the commons itself. For if data is not made available to improve the efficiency of businesses within the smart city, the effects will be primarily felt by the residents of that city rather than other consumers residing outside the commons. Similarly, the overruling of the commons' decisions could arguably be detrimental to local 'consumer welfare' whereby it would be contrary to the principles of competition law.

However, currently, based on the notion and treatment of 'green antirust' (Volkovski, 2022, p. 512), it does not seem likely that SCDCs would receive special treatment. 'Green antitrust' refers to the notion that measures that might otherwise be in violation of competition law, such as cooperation prohibited by Article 101, could either be exempt or receive special treatment due to their objective of achieving sustainability (Ibid, 2022, p. 502). In terms of national law, the Austrian Cartel Act was amended in 2019 to include a provision that carved out the 'world's-first green exemption' may be held as an example of 'green antitrust' (Zelger, 2022, p. 515). However, in the 2022 Guidelines on Vertical Agreements, the Commission explicitly states that such vertical agreements which pursue sustainability or 'contribute to a digital and resilient Single Market' are in fact, 'not a distinct category of vertical agreements', and as such are subject to the same conditions as all non-sustainable agreements. It is worth noting the reference to vertical agreements that 'contribute to a digital and resilient Single Market', would not receive special treatment either, implying SCDC are equally unlikely to receive special treatment.

Furthermore, SCDC would likely fragment the digital single market rather than contribute to it. For unlike the EU's vision of sharing non-personal data, the self-governance data through commons, could fragment the data market through differing conditions for sharing data imposed by each commons. Hence, there would arguably be even less incentive, from the EU's perspective, to grant favorable special treatment to the self-governance of SCDC. Consequently, it must be presumed that SCDC would be subject to the exact same restrictions on agreements covered by Article 101 as all other undertakings in terms of competition law.

Violations of Article 102 – Data as an Essential Facility

As the purpose of a SCDC is to govern the sharing of the data through what is essentially a monopoly, violations of Article 102 TFEU must be considered. Article 102 TFEU is intended to prevent the abuse of a dominant position, especially one that restricts market entry (Persch, 2021, p. 544), therefore, a SCDC gatekeeping the availability of data is prima facie in a prime position to be caught by this provision. Furthermore, noted in the EU's strategy for data, the availability and sharing of data is envisioned to not only improve existing services, but additionally develop new goods and services (European Commission, 2020, pp. 2-3). Consequently, in the context of Article 102 TFEU, the 'Essential Facilities Doctrine' (EFD) is arguably relevant, as it pertains to a situation where a monopoly refuses to grant access to a resource that is essential for the development of new products (Tommaso, 2020, p. 196).

Therefore, it is not inconceivable that a SCDC could face legal action following the denial of access to the smart city data. As has been demonstrated above, these decisions may have the capacity to influence the trade between EU MS, whereby it is justified to examine the hypothetical legal conflict from the lens of the EU and the EFD as it is applied in regard to Article 102 TFEU. This does not mean that smart city commons are necessarily free from similar concerns deriving from EU MS law, however, it is impractical to examine all the EU MS national competition law practices in the context of this paper, whereby the focus will be on the EU's interpretation of EFD.

Strictly speaking, in the EU case law, the CJEU refers to "refusals to supply or deal" rather than EFD (Graef, 2019, pp. 41-43), however for the sake of simplicity for this paper the term 'EFD' will be used in their stead. As a test for whether the refusal can be considered abusive, the CJEU uses a cumulative three step test which derives from a number of influential cases such as Magill and Bronner (Ibid, 2019). Under the Bronner criteria, the three steps are that the refusal is (1) not objectively justified, (2) the resource is 'indispensable' and (3) such refusal is likely to eliminate all competition (Czapracka, 2022, p. 278). However, from a data point of view, the caselaw of IMS Health and Microsoft is arguably more relevant, as they pertain directly to the refusal to deal in the context of Intellectual Property Rights (IPR) and data, especially as the ECJ granted access to data (Bruc, 2019, p. 185). Under IMS Health the criteria was characterized in paragraph 38 slightly differently, with firstly that the refusal must be preventing the emergence of a new product for which there is a potential consumer demand. Secondly, that it is

unjustified and thirdly the refusal must be such to exclude any competition on the secondary market.

When applying the IMS Health test to the context of SCDC, it is conceivable that a 'refusal to deal' data could potentially fulfill all three conditions. Although it must be clarified that despite copyright being frequently the focus such as in IMS Health, where the data was protected by copyright specifically, the considerations are considered to apply to all intellectual property (Slepak, 2020, p. 5). Consequently, as databases and data can be subject to both copyright and the EU's sui generis database protection (Bruc, 2019, p. 211), in the context of smart city data, the discussion will utilize the more IPR specific caselaw such as IMS Health and Microsoft.

Due to the the 2007 Microsoft case, it is best to start with the first and third step of the IMS Health test. In the Microsoft case, the General Court (GC) applied a lower threshold, albeit this is yet to be confirmed by the ECJ (Graef, 2019, p. 46). Under the GC's threshold it is sufficient that not all competition on the market is extinguished by a refusal to share a resource, as the 'likely' prevention of 'effective competition' is sufficient. Furthermore, the GC in T-201/04 further considered that it is sufficient that technical development is limited, which is a considerably lower threshold than the prevention of a new product.

Therefore, in the context of SCDC, if the EU's proposition that the sharing of data can develop new products is accepted, then arguably the smart city data for an entire city could plausibly be used to create such new products or services. Alternatively, if the GC's view is confirmed, it is even more likely that the "technical development" may be limited by the refusal to share such data, as for this to be true the data must only be somewhat useful in further developing a product, which based on the EU's strategy's view on the benefits of data would appear to be an almost certainty.

Furthermore, it is difficult to envision an alternative to the vast amount of data that would be collected through the public infrastructure that would constitute a smart city, for arguably the only feasible alternative would be an equivalent privately owned sensor network in the city. However, the latter would amount to not only a manifest waste of resources, similar to the situation with the monopolistic control of railroads that created the EFD in the U.S. (Pitofsky, 2002, p. 446), but it would also be questionable from an ethical point of view as its sole purpose would be to avoid obtaining consent for sharing and using the data. Hence, it is likely that there is not going to be any replacement for access to the data generated by the smart city, even one that is less advantageous. Consequently, it is reasonable to conclude that the first criteria for the EFD test could be fulfilled by a SCDC refusal to share data.

In addition, if the crucial nature of data for the development and emergence of new products is accepted, then it must follow that with a denial of access to said data, it will be difficult to compete. Consequently, it is reasonable to state that the third step of the test, the exclusion of competition on a secondary market, is entirely plausible. While it may be difficult to pinpoint specifically all the goods and services that may be developed or emerge with the use of smart city data, the nature of smart cities jeopardizes competition on any arising market therein without access to the smart city data. Smart city infrastructures provide raw data for markets for services based on data analysis.

Ostrom and Hess proposed in 2007 that the relationship between data, information and knowledge is such that information represents organized data which in turn can be analyzed to create knowledge (Ostrom and Hess, 2007, p. 8). This conversion of firstly organizing the data, and secondly deriving specific useful knowledge, is arguably a valuable economic service, as it can enable businesses that do not have such data analysis capabilities themselves to obtain valuable knowledge that may improve their competitiveness. Consequently, for an undertaking to be able to compete on such a market, arguably they must have access to the raw data itself to begin organizing and analyzing it. Hence, if such an undertaking is denied access, conceivably they cannot compete. As a direct result, should a SCDC bar access to their data to some or even all but one undertaking in this market, it would effectively prevent any competition on this secondary market. Thus, it must be concluded that the second and third condition could be fulfilled by the governance actions of a SCDC, even if the lowered threshold used by the GC in Microsoft is not used.

This therefore leaves only the second step of the test, the objective justification. An accepted objective justification has the possibility of preventing the behavior from being considered a violation of Article 102 (Van der Vijver, 2012, p. 60). There are three possibilities for objective justifications, legitimate business behavior, legitimate public interest objectives and efficiency considerations. At this stage it is worth recalling that while a commons is an undertaking in the meaning of EU competition law, it is not a business, rather it is a collective body for individuals to self-govern a resource, in this case data. While profits may be made, it is not the purpose of a commons, as its activities are not primarily guided by commercial concerns. Consequently, the first and third possible objective justification -legitimate business behavior and efficiency - are not applicable.

The second ground for an objective justification, a legitimate public interest consideration is far more applicable, especially considering the nature of a commons, which is essentially to protect the interests of the individuals that it consists of through the self-governance of the common resource. Furthermore, the ultimate purpose of Article 102 TFEU is to protect the consumers, and as noted earlier, SCDCs essentially consist of consumers. Therefore, as they self-govern access to their local smart city data, it is not unreasonable to argue that their decisions must

be in the public interest.

However, as case law has demonstrated, pleas of public interest are almost uniformly rejected, albeit often based on the facts of the case rather than the idea of public interest itself (Ibid, 2012, p. 66). Therefore, it is difficult to conclude in the abstract how the GC or CJEU would respond to a case involving a SCDC's objective justification of legitimate public interests. Denials could stem from the preferences of the community, rather than more conventionally accepted grounds of public interest such as public safety. This is arguably exacerbated by the notion that is detectable in the EU's strategy for data and the legal framework, that non-personal data is not considered to be capable of negatively influencing individuals, for any data that relates to an individual is protected by the GDPR and hence an individual has control over it.

However, as demonstrated in this paper, non-personal data can hang over a community like a modern sword of Damocles, with its consequences not necessarily being felt immediately, whereby, it may be desirable from a community point of view to not share the data. Such justifications, however, are likely to appear hollow from the perspective of the GC or CJEU, and thus decisions taken by SCDC could fulfill the second step. Consequently, it is entirely possible that refusals to share data by a SCDC could infringe Article 102 of the TFEU as they could fulfill all three criteria in the IMS Health test for an abuse of a dominant position.

Discussion

The vast amount of data that smart cities will produce undoubtedly will change the lives of their inhabitants, who at present are likely to have little say in how that data will be shared. The European legal framework for data does not envision or empower the local community in regard to the data that they will inevitably produce in a smart city, unless it falls under the definition of personal data under the GDPR. On the contrary, under the Open Data Directive, public sector bodies are obliged to make dynamic data gathered by sensors available and open, thereby bypassing the citizens entirely. This presents a unique opportunity to employ the commons theory of Ostrom to remedy the disempowerment of the smart citizens with an alternative that is neither public nor private, in the spirit of her original idea that broke away from the private-public dichotomy.

Nevertheless, in order to employ her theory in a city environment with smart city data, adaptations must be made. For example, the rather informally organized commons simply cannot be used in the context of a smart city, but rather the smart city data commons if they are to be truly empowered, must take on a legal form. In this regard, an interesting future research direction would be the possible legal forms national implementations of (smart city data) commons could take in the various Member States, which could effectively lay down the foundations for actual commons to be established, either experimentally or permanently.

Furthermore, the adoption of legal forms will bring with it considerable legal implications, such as those connected with competition law. The decision to not share data openly has the potential to cause conflict with the EU's competition law, especially articles 101 and 102 TFEU as has been demonstrated in the section above. These conflicts, if unresolved, or solved unfavourably from a commons perspective, have the potential to condemn smart citizens to perpetual disempowerment in regard to non-personal data gathered of them and their local community. Indeed, in light of the case law and the failure of 'green antitrust', the future prospects for a commons are rather grim from the perspective of caselaw, as theoretical violations are not merely plausible, but arguably almost inevitable for any commons that will decide not to share their data freely.

Naturally, there is no way to know what stance the courts will take until there is an attempt to implement a smart city data commons in the future in a smart city. Which is the primary limitation of this paper, as the analysis is based on caselaw that does not pertain to neither commons nor smart cities. Hence, despite the failure of 'green antitrust', there is still the possibility for the EU courts to decide either way. However, it would nevertheless arguably be desirable for the courts to take a favourable view of SCDCs on the basis that their ultimate purpose is the well-being of the smart citizens through self-governance. For by limiting the ability of SCDC to deny sharing of data, the only effect would be to effectively deepen the disempowerment of the local community in regard to the data that they produce and which can have serious negative consequences for both individuals and entire communities.

Conclusion

The EU's strategy for data contains a vision for a single market for data that produces economic benefits on a Union level. Thus, for the vision to work, data must be shared constantly to provide the 'lifeblood' for bringing the vision to life. The smart cities of the future promise to be a treasure trove of data, as the sensors record many parameters of life in the smart city, whereby such smart city data will be crucial for the success of the vision. However, underlying the vision is a presumption that non-personal data, especially from public sources including smart cities, will be shared absent restrictions. As a result, the individual citizen is essentially relegated to the role of a consumer that will receive economic benefits from the sharing of the data, in which despite producing much of the data, has no ultimate say in whether or under what conditions will the data be shared.

Consequently, this "neoliberal" vision for data arguably is in need of counterbalancing, by the empowerment of the

individual citizen in regard to the non-personal data that they produce by inhabiting a smart city. A possible solution is the self-governance of data through commons, whereby the smart citizens that inhabit a city will be empowered to share their data on their own terms.

However, such decisions may infringe the existing EU legal framework, especially if data is not shared either at all or only to certain undertakings. In this regard, there is a looming possibility of a conflict with EU competition law, as such measures may be categorized as abuses of a dominant position. While a commons' purpose is to govern a common resource subject to social dilemmas, in this case data, rather than being a commercial entity, regardless under EU competition law commons will be considered undertakings and be within its scope. Similar to the notion of 'green antitrust', it would appear that commons management of smart city data is unlikely to receive any special treatment in terms of EU competition law despite its objectives. As demonstrated, the commons are unlikely to benefit from any criteria under the current EU competition law framework that would enable them to be excluded from the scope of either Article 101 or 102.

Therefore, it is somewhat ironic that the competition law that is intended to combat the power of 'Big Tech' companies hinders the possible empowerment of consumers through the emergence of smart city data commons which are able to exert meaningful control over their non-personal data. Indeed, considering that the competition is intended to safeguard the welfare of consumers, it is unfortunate that it can also be used to limit possibilities for meaningful control over non-personal data through self-governance initiatives such as smart city data commons. Non-personal data is not necessarily free of consequences to individuals and may hang like a modern sword of Damocles over the inhabitants of a smart city. Hence, as the current EU competition law framework would likely restrict the meaningful governance opportunities of smart city data commons, arguably it is worth reconsidering whether commons really should be within its scope, and it is necessary to protect consumers from their own decisions regarding their data.

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Publication III

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Smart City Data Commons under the Data Governance Act – Lowering the Threshold Toward Introducing Smart City Data Commons

Aleksi Kajander

Tallinn University of Technology, Estonia
aleksi.kajander@taltech.ee

Thomas Hoffmann

Tallinn University of Technology, Estonia
thomas.hoffmann@taltech.ee

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Summary: Smart Cities will provide an unprecedented trove of data that is set to revolutionize the efficiency of cities and the competitiveness of businesses according to the EU's Strategy for Data. The governance of this data is concerning, for it is already evident that non-personal data can significantly affect communities, an effect which would be amplified in a smart city. However, under the EU's current legal framework the ability of communities to govern non-personal data in smart cities is almost non-existent. Consequently, smart city data commons have been highlighted as a possible solution, through which communities could be empowered to govern the data they generate. However, the question arises whether such commons could exist under the current EU legal framework. This paper aims to examine this question in the light of the Data Governance Act and whether smart city data commons could exist as data intermediation services or data altruism organizations.

Keywords: data governance act, DGA, EU law, commons, data, data governance

1 Introduction

If data is set to be the oil of the 21st century[1], then smart cities are to be the oil wells of the 21st century with massive amounts of data being generated continuously through numerous sensors in real-time. The widespread and rapid sharing of data for re-use is thought to be able to bring various economic, social,

1 BECKWITH, Richard, SHERRY, John, PRENDERGAST, David. *Data Flow in the Smart City: Open Data Versus the Commons.* In DE LANGE, Michiel, DE WAAL, Marjin (eds.). *The Hackable City*. Singapore: Springer Singapore, 2019, p. 206.

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and environmental benefits.[2] As can be seen from the European strategy for data, the EU shares this view and is heavily invested in reaping the benefits that large amounts of data are expected to bring to the competitiveness of businesses and the efficiency of governance.[3] Therefore, it is not surprising that the EU is currently putting in place an extensive legal framework that is set to regulate the sharing of data from a variety of sources, including data held by public entities, data intermediaries, and data altruism organizations.[4] However, beneath the considerations for efficiency and competitiveness, concerns have been raised regarding the ability of the individuals generating this data to govern its usage.[5]

In the context of smart cities particularly, the 'neo-liberal' vision for data, where citizens and individuals are reduced to the role of consumers with little to no ability to influence the governance of the data they generate daily, has been criticized[6]. This type of 'neo-liberal' smart city vision is arguably detectable in the European strategy for data as while the primarily economic benefits of the sharing of data is touted, the ability of citizens to decide upon how the data they generate is shared is scarcely mentioned. In principle, the EU's legal framework separates data into two categories, personal and non-personal data, whereby theoretically any data that has an impact on an identified or identifiable person will be protected as personal data through legislation such as the General Data Protection Regulation (GDPR). Although, it must be noted that the control an individual has over even their personal data is limited primarily to the question of whom do they want to sell it to[7], which is consistent with a neo-liberal approach. However, in practice, there are already today extensive ecosystems (such as Waze) which generate data similar to that of a smart city, which demonstrate that the sharing of such non-personal data can have a significant impact on the communities if shared openly.[8] Thus, those local communities, and by extension the individuals that constitute them, arguably have not only a strong incentive, but also a necessity to govern what data is shared, even if that data is non-personal in the EU sense. However,

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2 FINCK, Michele, MUELLER, Marie-Sophie. Access to Data for Environmental Purposes: Setting the Scene and Evaluating Recent Changes in EU Data. *Journal of Environmental Law,* 2023, vol. 35, p. 120.

3 EUROPEAN COMMISSION. A European Strategy for Data. COM(2020) 66 final, 2020, p. 1.

4 See also VARDANYAN, Lusine; KOCHARYAN, Hovsep. Critical views on the phenomenon of EU digital sovereignty through the prism of global data governance reality: main obstacles and challenges. *European Studies – Review of European law, Economics and Politics*, 2022, vol. 9, no. 2, pp. 110–132 DOI: 10.2478/eustu-2022-0016, or GÁBRIŠ, Tomáš; HAMUĽÁK, Ondrej. 5G and Digital Sovereignty of the EU: The Slovak Way. *Taltech Journal of European Studies*, 2021, vol. 11, no. 2, pp. 25–47. ISSN 2674-4600. DOI 10.2478/bjes-2021-0013.

5 BORRAS, Susana, EDLER, Jakob. The role of the state in the governance of sio-technical systems transformation. *Research Policy,* 2020, vol. 49, no. 5, p. 4.

6 CARDULLO, Paolo, KITCHIN, Rob. Smart urbanism and smart citizenship: The neoliberal logic of 'citizen-focused' smart cities in Europe. *Environment and Planning C: Politics and Space,* 2019, vol. 37, no. 5, pp. 813–83

7 EUROPEAN COMMISSION. A European Strategy for Data. COM(2020) 66 final, 2020, p. 10.

8 KAJANDER, Aleksi. Legal Perspectives on Smart City Data As A Commons. *International Comparative Law Review*, vol. 22, no. 2, p. 20.

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the EU's legal framework does not appear to recognize this possibility, which is concerning as the effects are already visible even without fully-fledged smart cities and will continue to be exacerbated as the amount of smart city data steadily increases.

To counteract this development, the concept of a 'sustainable' smart city has been suggested as an alternative that empowers the individuals living in smart cities in regard to their data. In this vein, Ostrom's commons[9] management has been suggested as a means of governing smart city data by the local communities that generate the data.[10] Ostrom's commons are an attractive solution as they would re-empower the community through local self-governance based on the principles she identified in long-lasting commons from around the world. The incorporation of Ostrom's eight commons principles could provide a sustainable future for the smart cities from the human perspective as the local communities that will be affected by the sharing of their data, will be able to have meaningful control over the sharing of the data they all as a community generate. This can be considered a clear improvement over the alternative of being reduced to consumers with little or tokenistic ability to influence the sharing of the data generated by their community.

However, such initiatives are likely to run counter to the already existing EU legal framework, for the predominant approach – as can be seen from the Open Data Directive, the Data Governance Act (DGA) and the recently enacted Data Act (DA) – is that data should be made available by default, provided it is not subject to copyright protection or confidentiality.[11] Yet, the Data Governance Act provides an interesting possibility in the form of data intermediaries and data altruism organizations, which *prima facie* could be used as legal forms for implementing smart city data commons that could enable local communities to govern the sharing of their non-personal data. Therefore, this paper aims to answer the question of could smart city data commons be introduced as data intermediation services or data altruism organizations under the Data Governance Act.

2 The Data Governance Act

The Data Governance act which became applicable in September 2023 is intended to increase availability and trust in data sharing as well as encourage data sharing to accomplish the aims envisioned in the European Strategy for Data. The Act builds upon previous EU legislation such as the Open Data Directive by further

9 OSTROM, Elinor. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press, 1990.

10 KAJANDER, Aleksi. Legal Perspectives on Smart City Data As A Commons. *International Comparative Law Review*, vol. 22, no. 2, p. 11.

11 See Article 5 of Directive (EU) 2019/1024 on open data and the re-use of public sector information (recast), Regulation (EU) 2022/868 on European data governance amending Regulation (EU) 2018/1724 (Data Governance Act).

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regulating the re-use of data by public sector bodies in order to facilitate its re-use. Moreover, the DGA introduce requirements for two new concepts related to the sharing of data: data intermediation services and data altruism organizations. The former is focused on sharing data through commercial relationships, while the latter is intended to increase the sharing of data voluntarily without seeking profit. These two data entities represent interesting possibilities for the future of data governance from a smart city perspective, as both could *prima facie* be used to further the empowerment of individuals in regard to their data.

Moreover, the Data Governance Act represents a shift in the approach to non-personal data, for the DGA acknowledges in its recitals[12] that not all non-personal data is alike, and some categories of non-personal data may in fact be considered sensitive. In this regard, the need for defining such categories of non-personal data in more detail in future legislation as well as safeguards in the transfer of such non-personal data are noted in the DGA.[13] This represents a rather significant shift as previously non-personal data, provided it was not protected by intellectual property, was not seen as possibly being sensitive or needing specific safeguards, although it must be mentioned that the DGA also specifically mentions intellectual property affected data as warranting additional protection.[14] Similarly, the DGA identifies non-personal data reverting to personal data as a potential danger of releasing non-personal data, which corresponds to the approach under the personal and non-personal data dichotomy, whereby data cannot affect individuals unless it can be traced to a specific individual.

Nevertheless, arguably the examples highlighted in recital 24 open the door for additional data sets to be considered as sensitive, especially as the list of relevant sectors included transport, energy and the environment.[15] It is not far-fetched to suggest that at the very least some forms of non-personal smart city data could conceivably be considered sensitive in the future. For example, it can already be seen that quasi-smart city data that enables traffic to adjust to blockages practically in real time can produce undesirable effects on local residents.[16] As a result it could conceivably become to be considered as such sensitive non-personal data in the future. Therefore, it would appear that the EU is beginning to consider the impact

12 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recitals 20, 24

13 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 24

14 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 20

15 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 24.

16 KAJANDER, Aleksi. Legal Perspectives on Smart City Data As A Commons. *International Comparative Law Review*, vol. 22, no. 2, p. 20.

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that the increased collection of data, especially in real-time, and its sharing may have even if it is non-personal. Considering the vast amount of data of different types a smart city can generate, it is not unreasonable in the slightest to suggest it is likely to have unforeseen and undesirable effects on the inhabitants if shared automatically and indiscriminately even if it is non-personal.

However, at present, the DGA only makes one reference to 'dynamic data', which best corresponds to the concept of smart city data and acknowledges that individuals may be in need of empowerment in regard to such dynamic personal data that they would generate through the network of internet of things (IoT) devices that comprise a smart city. The DGA proposes that data intermediaries may help in enhancing the agency of individuals in this regard through assisting them in exercising their rights under the GDPR.[17] Therefore, the DGA does not acknowledge, at least directly, the possibility of citizens needing empowerment not only in relation to their IoT personal data, but also in relation to non-personal IoT data that is generated not by their own sensors and devices, but those that will inevitably surround them in a smart city.

Nevertheless, if data intermediaries according to the DGA recitals can be used as a tool to improve the agency of data subjects, then arguably the possibility of doing the same in regard to non-personal data of smart citizens should be investigated under the DGA. Consequently, this paper will investigate the possibility of using the DGA's novel data entities as potential tools for the future to empower smart citizens in regard to their non-personal data.

3 The Need for the Governance of Non-Personal Smart City Data through Commons

3.1 The Alternative Smart City Visions

While many definitions for a smart city exist, the common fundamental concept is the integration of information and communications technologies (ICT) in order to improve the efficiency and functioning of the city.[18] Therefore, through this integration of ICT an incredible array of data will be generated in real-time through a multitude of sensors installed around a smart city. Through the data provided by these sensors it will be then possible to not only make intelligent governance decisions, but additionally that data will carry a significant commercial value as it will enable businesses to adjust their operations to the behavior and trends of the inhabitants of the smart cities. The resulting financial and governance benefits have frequently been highlighted, including in the EU's strategy for data[19]. This has led to criticism that this 'neoliberal' approach is neglecting an important

17 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 30.

18 VAN DEN BUUSE, Daniel, KOLK, Ans. An exploration of smart city approaches by international ICT firms. *Technological Forecasting & Social Change,* 2019, vol. 142, p. 221.

19 EUROPEAN COMMISSION. A European Strategy for Data. COM(2020) 66 final, 2020.

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aspect of this arrangement[20], the data generators, that is to say, the individuals inhabiting the smart city.

This 'top-down' model that neglects citizen participation for a smart city has been subject to considerable criticism in literature.[21] As a result, alternative models for smart cities have developed, which are best incorporated under the widely influential definition of a 'sustainable smart city' itself derived from over 120 definitions for a smart city.[22] Under this definition, a sustainable smart city is 'innovative city that uses information and communications technologies and other means to improve living standards, efficiency of urban management and urban services and competitiveness while meeting the needs of current and future generations in the sectors of the economy society and environment'.[23] While still incorporating the aforementioned factors of competitiveness and efficiency, the inclusion of sustainable social factors is notable and as such this definition serves as a unifying umbrella for discussing the often previously neglected citizen participation related dilemmas.

In this vein, it is useful to utilize the 'ladder of citizen participation' created by Arnstein in 1969[24] which has subsequently been adapted and expanded upon by Cardullo and Kitchin in the smart city context as a 'scaffold of smart citizen participation'.[25] Initially, Arnstein created a eight rung ladder that corresponds to the level of citizen power. These can be summarized in three main categories, the first of which is non-participation which essentially means the education and steering of citizens from the top. The second category, tokenism, provides a voice and some degree of perceived authority, although this is more akin to an 'empty

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20 KNIEPS, Gunter. Internet of Things and Economics of Smart Sustainable Cities. *Competition and Regulation in Network Industries*, 2017, vol. 18, no. 1.

21 See for example ENGELBERT, Jiska, VAN ZOONEN, Liesbet, HIRZALLA, Fadi. Excluding citizens from the European smart city: The discourse practice of pursuing and granting smartness. *Technological Forecasting & Social Change*, 2019, vol. 142., ANDREANI, Stefano, KALCHSCHMIDT, Matteo, PINTO, Roberto, SAYEGH, Allen. Reframing technologically enhanced urban scenarios: A design research model towards human centered smart cities, *Technological Forecasting & Social Change*, 2019, vol. 142., MARTIN, Chris, EVANS, James, KARVONEN, Andrew. Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America. *Technological Forecasting & Social Change*, 2018, vol. 133., CARDULLO, Paolo, KITCHIN, Rob. Being a 'citizen' in the smart city. *GeoJournal,* 2019, vol. 84., BARR, Stewart, LAMPKIN, Sal, DAWKINS, Laura, WILLIAMSON, Daniel. Smart cities and behavioural change: (Un)sustainable mobilities in the neo-liberal city. Geoforum, 2021, vol. 125., HOLLANDS, Robert. Critical Interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society*, 2015, vol. 8, no. 1.

22 VAN DEN BUUSE, Daniel, KOLK, Ans. An exploration of smart city approaches by international ICT firms. *Technological Forecasting & Social Change,* 2019, vol. 142, p. 221.

23 INTERNATIONAL TELECOMMUNICATIONS UNION. Smart sustainable cities: an analysis of definitions. [online] Available <http://www.itu.int/en/ITU-T/focusgroups/ssc/Pages/default.aspx> Accessed: 10.01.2025.

24 ARNSTEIN Sherry. A Ladder of Citizen Participation. (1969), *Journal of the American Institute of Planners*, 1969, vol. 35, no. 4.

25 CARDULLO, Paolo, KITCHIN, Rob. Being a 'citizen' in the smart city. *GeoJournal,* 2019, vol. 84, pp. 3–5.

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ritual'[26] as it is unable to change the *status quo*. Finally, the three final rungs can be summarized as 'Citizen Power' providing actual meaningful authority and active participation.

Cardullo and Kitchin expanded upon this ladder by adding a ninth rung of 'choice' between tokenism and non-participation which considers the roles of the smart citizens, which in the case of 'choice' is that of a consumer.[27] This is reflective of the discourse in the European Strategy for Data, where even in regard to private data the citizen is essentially a consumer who can choose whom they wish to sell (or not) their data to, which is the extent of their empowerment in regard to data, for there are overruling economic concerns that warrant the limiting of the role of the individual citizen. This is further evidenced by the privatization of the smart city infrastructure which has long since been criticized for further reducing the possibilities for meaningful citizen decision-making in terms of smart city data.[28] This is further exacerbated by the resulting transfer of data for infrastructure where money strapped local governments accept the offer of being provided the physical infrastructure needed for the smart city by private entities in exchange for the data produced thereby. As a result, the smart citizen inhabiting such a city is effectively side-stepped on multiple levels, whereby their participation is often tokenistic at best, which still appears to be the norm in many smart city projects.[29]

3.2 The Need for Smart Citizens to Govern Their Non-Personal Data

The need for smart citizens to ascend the scaffold of smart citizen participation and govern their data is becoming increasingly apparent[30] despite the fact that smart cities have arguably not yet fully materialized. However, the effects of the open sharing of data similar to that which the sensors of a smart city would generate have already been visible on communities.[31] Perhaps the best example of this would be the impact the traffic application Waze has had on communities in cities where the application is used. The application essentially provides real-time data on the traffic situation in an area, and based on that provides more

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26 ARNSTEIN Sherry. A Ladder of Citizen Participation. (1969), *Journal of the American Institute of Planners*, 1969, vol. 35, no. 4, p. 216.

27 CARDULLO, Paolo, KITCHIN, Rob. Being a 'citizen' in the smart city. *GeoJournal,* 2019, vol. 84, p. 5.

28 MARCH, Hug, RIVERA-FUMAZ. Smart contradictions: The politics of making Barcelona a Self-sufficient city. *European Urban and Regional Studies*, 2016, vol, 23, no. 4, pp. 824–825.

29 WILLIS, Katharine, NOLD.Sense and the city: An Emotional Data Framework for smart city governance. *Journal of Urban Management*, 2022, vol. 11, p. 150.

30 ENGELBERT, Jiska, VAN ZOONEN, Liesbet, HIRZALLA, Fadi. Excluding citizens from the European smart city: The discourse practice of pursuing and granting smartness. *Technological Forecasting & Social Change*, 2019, vol. 142, p. 353, MARTIN, Chris, EVANS, James, KARVONEN, Andrew. Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America. *Technological Forecasting & Social Change*, 2018, vol. 133, p. 271.

31 KAJANDER, Aleksi. Legal Perspectives on Smart City Data As A Commons. *International Comparative Law Review*, vol. 22, no. 2.

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efficient and quicker routing options for its users.[32] However, this has resulted in previously quiet and low-traffic neighborhoods in receiving an overwhelming amount of traffic which in turn has raised protests from those local communities over grounds of safety and comfort.[33] From such examples it is important to recognize that the local communities as a whole have arguably both a need and desire to govern the sharing of the data that pertains to not a particular individual inhabitant, but the community as a whole.

This need is expected to grow as smart cities begin to emerge and the amount of data parameters that are recorded increases, whereby it is almost inevitable that the unexpected and undesirable effects they have on the local communities will similarly increase. For example, with the previous example, it should be noted that 'Waze' is currently reliant on user input for data, whereas in a true smart city environment the data would be automated as it would be derived in real-time from the sensor network around a city. This is a key difference to the notion of 'true' smart city data which can be defined as data that is generated through the network of sensors and other ICT infrastructure integrated into a smart city, typically in real-time. In the case of 'true' smart city data, the generation of the data will be relentless and essentially independent of any human efforts, which unlocks the potential for a truly massive amount of data to be continuously generated.

This type of data fits the definition of 'dynamic data' in the Open Data Directive in the EU's legal framework for data. When it is recognized that the same Directive requires that public sector bodies make dynamic data, such as that which would be generated from a smart city, 'available for re-use immediately after collection'[34] it is evident that a conflict is looming with the interests of the smart city inhabitants and the effects that such sharing of data by default may have on them. This issue is further exacerbated by the fact that broadly speaking, under the EU framework data is separated into personal and non-personal data. While an individual has rights and control over the former, the latter is currently largely unregulated, except for specific exceptions such as 'dynamic data' in the Open Data Directive. Therefore, this paper will focus on the issue of governing non-personal smart city data that is outside the scope of the GDPR. As a result, in practice this dichotomy leaves the communities of smart cities in a bind. From a legal perspective they will struggle to have the ability to govern the data they generated, for under EU legislation the dynamic data from their community is to be made available regardless of their views on the topic.

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32 LITTMAN, Jonathan. *Waze Hijacked L.A. in the Name of Convenience. Can Anyone Put the genie Back in The Bottle?* [Online] Available at: <https://lamag.com/featured/waze-los-angeles-neighborhoods > Accessed 05.05.2024

33 LITTMAN, Jonathan. *Waze Hijacked L.A. in the Name of Convenience. Can Anyone Put the genie Back in The Bottle?* [Online] Available at: <https://lamag.com/featured/waze-los-angeles-neighborhoods > Accessed 05.05.2024

34 Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information, Article 5 (5).

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This making of dynamic data available by default through the Open Data Directive is arguably representative of a conflict with the principle of subsidiarity, as the decision is currently made on an EU-level rather than a local level. This arrangement leaves the local communities essentially powerless and voiceless in regard to the data that will be generated in their area, even if the sharing of such data would result in negative consequences to the community. Consequently, this current arrangement is likely to become increasingly untenable and unsustainable in the long term owing to the inability of the local communities in smart cities to exert meaningful decision-making over the non-personal data generated within their area.

However, this obligation only applies if the dynamic data is held by a 'public sector body', therefore should the smart city data generated by the ICT infrastructure in a smart city be governed and held by a non-public sector body, there would not be an obligation to share it by default. Therefore, when combining the need and legitimate interest that local communities have in governing the sharing of data pertinent to their community and the EU-law obligation for public sector bodies to make dynamic data available immediately, the logical solution would be to have a non-public sector body governed by the smart city community hold the data. This would effectively re-empower the smart city inhabitants in regard to their non-personal data, as they would be able to regulate the sharing of it, to prevent negative outcomes such as in the case of Waze.

As a result, the possibility of establishing commons that would enable the local communities in smart cities to self-govern the sharing of their data is arguably a viable and attractive solution that would enable the smart citizens to ascend the scaffold of smart citizen participation. Moreover, smart cities represent an ideal opportunity for self-governance as ICT technologies provide additional opportunities for public participation.[35] The commons are a middle ground between private and public ownership, and as such would be free of the data sharing obligations instilled by the EU's legal framework for data that affects public sector bodies. Moreover, as Ostrom focused on long-lasting commons that have survived for hundreds of years to identify her eight principles of governance, arguably this would provide a sustainable basis for the governance of smart city data.

While Ostrom's theory initially dealt with physical depletable resources it has since been adapted and adjusted to non-physical resources such as knowledge.[36] These types of 'knowledge commons' are characterized as 'common arrangements to overcome various social dilemmas associated with sharing and producing

35 MESZAROS, Edina. Collaborative Governance for Smart and Sustainable Cities of the 21st Century. Case Study: The City of Oradea. *The Review of European Law, Economics and Politics,* 2021, vol. 8, no. 1, p. 215.

36 MARQUES, Maria, MARQUES, Jamile, GARCIA, Blanca, CORTESE, Tatiana. Contributions to Knowledge-Based Development ThroughCommons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, 2021, vol. 10, no. 1, p. 9.

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information'[37]. Consequently, as it has been demonstrated that the automatic sharing of non-personal data in a smart city context will almost inevitably lead to social dilemmas for the local community, the commons arguably represent a suitable means of governing the sharing of non-personal data. Furthermore, smart city data that is generated by a smart city, or a neighborhood or other division of such a city, arguably the local community that is affected by the sharing of the data is the logical level at which to govern the sharing of the data produced in that area. This would arguably be a far more reasonable arrangement than having a blanket sharing policy established on the EU-level which is likely to not be in accordance with the needs and desires of the local communities affected in smart cities around Europe, each of which will have their own specific social dilemmas.

However, a key difference between the commons Ostrom studied and the hypothetical smart city commons is that the latter would be instituted in a large city, whereas the commons studied by Ostrom were primarily based in rural areas and on rather informal practices from a legal point of view. Therefore, if such commons would be instituted in a city environment in the EU, they would have to have legal form and the appropriate authority to govern data. In this regard, the Data Governance Act provides *prima facie* for two interesting solutions to instituting commons in a smart city environment, the data intermediary and the data altruism organization, both of which are non-public sector organizations that share data.

3.3 Smart City Data Holders

The ownership of non-personal data that is not subject to intellectual property protection is a complicated question in the EU, however, it is relevant for exploring the possibility of empowering local smart citizens in regard to their non-personal data. Firstly, for local smart citizens to have any hope of empowering themselves and deciding what non-personal smart city data they wish to share, they must be considered the 'data holder' of that data under the DGA. Consequently, it is necessary to briefly examine the current frameworks for data ownership as it pertains to smart city data or data that is comparable to it.

Firstly, under the DGA, a 'data holder' is a legal person, public sector body, or a natural person that is not the data subject, but who in accordance with national or EU law has the right to grant access to or share certain personal or non-personal data. As smart city data from sensors can not reasonably be considered to be the intellectual creation of any individual, it is not eligible for copyright protection. Therefore, the local community would need to be empowered through national or EU legislation to have control over such data. The utility of the new types of data entities introduced in the DGA become readily apparent as arguably it would be significantly more difficult to make national legislation from scratch that would

37 MARQUES, Maria, MARQUES, Jamile, GARCIA, Blanca, CORTESE, Tatiana. Contributions to Knowledge-Based Development ThroughCommons Theory, Using Data as a Common Good. *Revista de Gestao Ambiental e Sustentabilidade*, 2021, vol. 10, no. 1, p. 9.

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introduce the concept of a 'data commons' empowered to govern the regulation of non-personal smart city data produced in an area. By contrast, using the DGA, national legislation could arguably be amended with less difficulty to empower local data intermediary organizations or data altruism organizations to decide how data generated by the smart city sensors in their area will be shared.

This approach should be considered in relation to the obligation to share dynamic data under Article 5(5) of the Open Data Directive, as public sectors are obliged to make dynamic data available immediately after collection. The wording of Article 5(5) does not provide for the possibility to discriminate in the sharing of different types of data. This provides for an interesting dilemma, as long as the public sector bodies are the data holders of dynamic data, they appear under the EU's legal framework to be compelled to share that data regardless of the consequences it may have. This appears to be an interesting feature of the EU's legislative framework on data that may have unintended and far-reaching consequences in the future when smart cities begin to emerge in earnest, as Article 5(5) basically renders even the local public sector bodies powerless to stop the sharing of the non-personal data generated.

In this respect, it could be argued that it may even be imperative that public sector bodies do not become the data holders for their non-personal smart city data as they will be forced to make it available under Article 5(5) of the Open Data Directive. As a result, national legislation that designates a non-public sector body, such as a data intermediary or data altruism organization as the holder of the data and therefore with the ability to share that data, would re-empower the local community in regard to their data. Hence, it is clear that a data intermediary or data altruism organization could be made to be the data holders of smart city data, and therefore they could be considered a viable platform to implement commons management of smart city data by local smart citizens.

3.4 Data Intermediaries

The DGA places high expectation on the benefits of data intermediaries by referring to them as having a 'key role' in the data economy.[38] The envisioned benefits stem from their ability to both facilitate and share large amounts of data to create the common European data space envisioned by the EU in its strategy for data. Moreover, the DGA references the empowering potential of data intermediaries through 'data cooperatives' that have as their objective the empowerment of data subjects through being better informed of their rights and collective bargaining.[39] These data cooperatives are however envisioned to only

38 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 27.

39 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 31.

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function in relation to personal data and the exercise of rights provided to data subjects under the GDPR. Consequently, at least in the context of smart city data, which is to say 'dynamic data' in the meaning of the Open Data Directive, there is still a gap created by the legislative framework as it does not provide a possibility of governance for communities affected by the sharing of non-personal data.

Nevertheless, as the fundamental purpose of the data intermediaries is to establish commercial relationships for data sharing[40], it would nevertheless enable control over the release of data held by the intermediary. Moreover, the proceeds attained from the sharing of the data would flow back to the data intermediary which if owned by a local community could be spread among the citizens. This would prevent the situations where public authorities have traded the hardware necessary for smart city data collection in exchange for the indefinite sharing of the data with the private company that provided that hardware.[41] This type of arrangement, which trades a short-term cost saving in the provision of hardware for a long-term loss of control over data sharing, also removes the chance of the local community benefiting financially from the valuable data that they produce on a daily basis. As a result, a data intermediary that would share the proceeds with the community that generated the data would arguably be a much more equitable solution from a financial perspective.

Therefore, if commons management was to be applied in a smart city context to empower smart citizens in regard to the non-personal dynamic data they generate, a data intermediary in the meaning of the DGA could be an attractive solution at first glance. It would enable the local community to self-govern the sharing of the dynamic data they generate through the establishment of commercial relationships for the sharing of the data that they consider appropriate to be shared. This would however have some caveats on a practical level as data intermediaries are bound by the rules of competition law, and that access to their service is not discriminatory.[42] Thus, a commons data intermediary would likely not be able to discriminate against, for example, large multinational companies through providing different terms on equal transactions when compared to local small businesses without a significant risk of competition law violations. Consequently, such commons like data intermediaries would inevitably simply have to choose which types of non-personal dynamic data is too sensitive to be shared at all, and share the data that can be shared in a non-discriminatory manner.

Moreover, a more fundamental conflict is identifiable with the commercial nature of data intermediaries and the commons intended to resolve social

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40 CAROVANO, Gabriele, FINCK, Michele. Regulating Data Intermediaries: The Impact of the Data Governance Act on the EU's data economy. *Computer Law & Security Review*, 2023, vol. 50, no. 5.

41 MOROZOV, Evgeny, BRIA, Francesca. *Rethinking the Smart City Democratizing Urban Technology.* New York:Rosa Luxemburg Stiftung, 2018, pp. 8–10.

42 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), Article 12 (f).

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dilemmas and thereby primarily focus on the common good rather than commercial considerations. As per Article 2 (11) of the DGA data intermediaries by definition are only those services which aim to "establish commercial relationships for the purposes of data sharing", this would restrict the way in which a hypothetical smart city data commons organized as a data intermediary could operate as it would have to be primarily of a commercial character rather than (self)governance orientated. Even the perception of a commons that is intended to solve social dilemmas for the local community being a primarily commercial entity would likely not be attractive proposition for the local community due to the apparent conflict of interest between commercial concerns and those of the local community. For in a commons, the latter should always come before the former.

Furthermore, it would appear that despite the suitability of the data intermediary entity for the empowerment of local communities even in relation to their non-personal data, it seems unlikely that this type of locally owned data intermediary would fit the requirements of the DGA. An important part of the definition of a data intermediary is that it does not provide its services in a 'closed group'[43]. As clarified in Article 2(11) (c), services 'used by multiple legal persons in a closed group' are specifically excluded from, the definition of a data intermediary. The entities, which likely will include numerous legal persons, that a smart city data commons chooses to share their data with could be interpreted as a 'closed group' as the sharing of the data would have to be approved first by the commons. Therefore, the resulting 'marketplace' for data would not be open, but rather subject to prior approval of the commons, where the decisions to share data would not necessarily be primarily guided by commercial concerns, but those of the community in relation to their existing social dilemmas. Therefore, if a commons type of data intermediary is created exclusively for the purpose of sharing the data generated by the area governed by that commons in a smart city, it seems likely that such a data intermediary would fall afoul of this part of the definition in the DGA.

Consequently, this would mean that if such a commons type of data intermediary was to be set up, it would have to remain open to facilitate the sharing to others in order to not risk being considered a 'closed group', which arguably begins to defeat the point of being a tool to enable the self-governance of non-personal data generated by the area covered by the commons. As a result, unfortunately, despite the surface-level potential of data intermediaries being a legal form for the enabling of community self-governance of non-personal dynamic smart city data, they would not fall into the DGA's definition of a data intermediary. Thus, if data intermediaries are unsuitable, that leaves the other new data entity created by the DGA, the data altruism organization.

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43 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), Article 2 (11) (c).

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3.5 Data Altruism Organizations

In addition to data intermediaries that operate for commercial interests, the DGA introduces data altruism organizations that make data available voluntarily for objectives of general interest.[44] The intention behind this being that data holders may wish have their data used for purposes of general interest.[45] This is done either on the basis of consent for personal data or in the case of non-personal data with that of the data holder. In the latter case the limits of the data usage are based on the permissions given by the data holder.[46] Therefore, conceivably data altruism could serve as an alternative pathway to establishing local self-governance over smart city dynamic data where the local community is able to determine the accepted uses for the data they generate.

The DGA does not provide an exhaustive list of 'objectives of general interest' that data altruism organizations may serve, but the listed examples include improving mobility, combating climate change, and improving the provision of public services.[47] While some of the listed examples are likely already broad enough to encompass the objective of governing the smart city's dynamic data, the DGA's Article 18 (b) provides that national legislation will finally determine which objectives may be served by data altruism organizations. Therefore, there is considerable flexibility in regard to which objectives a data altruism organization could be set up, as the Member States retain control over this aspect. As a result, the pursuit of community interests through self-governance of dynamic smart city data could be conceivably be defined in national law as such an objective.

Moreover, the legal form for data altruism organizations under Article 18 (c) would appear to be restricted to non-profit associations or similar legal forms in Member States' national legislations. This corresponds with existing preferences that local communities have expressed during commons initiatives, such as in the case of Dampbusters[48], where the community did not wish to trust either private or public entities with the data they considered sensitive, but instead left the data

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44 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 45.

45 ZARSKA, Petra, MESARCIK, Matus. Dualistic Data Property Right: Solution for Controllership of Data in the European Union? *International Comparative Law Review*, 2021, Vol. 21, No.2., p. 59.

46 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 50.

47 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), recital 45.

48 BALESTRINI, Mara, ROGERS, Yvonne, HASSAN, Carolyn, CREUS, Javi, KING, Martha, MARSHALL, Paul. A City in Common: A Framework to Orchestrate Large-Scale Citizen Engagement Around Urban Issues. CHL Conference on Human Factors in Computing Systems, Denver, Colorado, USA, 2017.

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with a non-profit association. This in turn very much reflects the spirit of Ostrom's commons that is a 'middle-ground' between private or public solutions.

However, this naturally comes at a cost when compared to the potential that a data intermediary could have offered for a smart city data commons, which is to say the possibility of providing profits from the sharing of the data back to the community. Under the DGA data altruism organizations must operate on a not-for-profit basis[49] and while they are not prohibited from charging fees for the sharing of the data, such fees must be limited to what is needed to cover the costs incurred in making the data available[50]. Consequently, financial community benefits will be rather limited, Anyhow, conceivably they could extend to what is necessary to keep the sensor network generating the data running as well as the operating costs of the non-profit organizations. However, as the fundamental purpose of the commons is to enable the local community to be able to restrict the sharing of non-personal data that is collectively detrimental to their community, a data altruism organization will enable the local community to carry out this function.

Moreover, as the DGA notes, data altruism organizations may also serve to share personal data based on the consent of the data subjects. This could further empower the local smart citizens as such a data altruism organization could similarly be used to provide guidance and information on the sharing of their personal data, including through the organization itself based on informed consent. As a result, community data altruism organizations could effectively serve as centers of empowerment in regard to both personal and non-personal data of the smart citizens of a given area in a smart city. The overall impact of such an arrangement would be beneficial as it would serve to prevent smart citizens from being both disempowered in regard to their personal data and undesirable effects that would result from the thoughtless sharing of non-personal smart city data.

4 Conclusion

While the smart city is hailed to bring significant economic benefits, the role of smart citizens is seemingly often overlooked. This is notable in the developing EU legal framework regarding data that is seeking to create a common European data space. Within this framework it would appear that a blind spot has developed to the dangers that the unrestricted and automatic sharing non-personal smart city data may have collectively on the community that produces it. The presumption that only personal data can have an appreciable effect on individuals stemming from the GDPR is proving to be increasingly perilous.

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49 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), Article 18 (c).

50 Regulation (EU) 2022/868 of the European Parliament and the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), Article 2 (16).

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This is evidenced by the Open Data Directive's obligation for public bodies to make dynamic data immediately available in order to drive these economic objectives. As it is already evident from cases where the impacts of quasi-dynamic data are felt, such as in the case of traffic applications that still rely on user uploaded data, the release of non-personal data may not be desirable from a collective point of view. However, it would appear that this type of concern did not occur to the drafters of the Open Data Directive, as currently the wording of the Directive effectively binds the hands of the local public authorities. This in turn traps both the local authorities and the local community into being potentially unwilling participants in the automatic sharing of the data that they generate in real-time in a smart city.

As smart cities have not yet emerged in earnest, the effects of these policies are not presently evident. However based on the case studies and examples available, these conflicts are almost certain to emerge, whereby it is not a question of if, but rather when. Consequently, the time to consider the empowerment of local communities by enabling the self-governance of the sharing of the dynamic smart city data generated by that local community is now before those problems become fully realized in practice. Arguably, this oversight in the ignoring of the role of local communities in the automatic sharing of data is creating a need for a credible solution to address this gap.

Moreover, in light of the Open Data Directive in particular, it would appear that such a solution cannot be a public one, as presently the hands of public authorities are tied in terms of control of the sharing of dynamic data. Therefore, a solution outside of the private-public dichotomy in the form of Ostrom's commons is not only credible but arguably warranted. Considering such commons have been used to manage community resource sustainably for centuries to balancing competing interests and social dilemmas, it would be foolhardy to ignore them in the present context. Moreover, it is evident that the DGA's data altruism organizations provide a feasible platform to formalize such type of a governance solution.

The commons Ostrom wrote about originally were often informal arrangements that had been preserved due to their proven effectiveness over the centuries, and as such it is evident that in order to transform those arrangements into a formal and legally formalize them would have to be accomplished for them to have a meaningful effect. Therefore, the DGA provides exactly the type of pathway that could be capitalized on to introduce such types of governance forms to smart cities in regard to the non-personal data of the smart citizens. Arguably the threshold to at least experiment with such governance arrangements is considerably lowered by the introduction of the DGA as it provides for of data altruism organizations that can readily be adapted to function as a commons for dynamic smart city data. As a result, it is evident that the misplaced presumption that the automatic sharing of non-personal data will not have an effect on smart citizens will have to be addressed sooner or later. Moreover, under the DGA

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there is a credible way to address this gap by the utilization of data altruism organizations as a means of self-governance for smart citizens.

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Curriculum vitae

Personal data

Name:	Aleksi Oskar Johannes Kajander
Date of birth:	03.04.1994
Place of birth:	Tampere
Citizenship:	Finland

Contact data

E-mail:	aleksi.kajander@taltech.ee

Education

2020–2025	Tallinn University of Technology, PhD
2018–2020	Tallinn University of Technology, Master of Arts in Law, Law and Technology, *cum laude*
2017–2018	Uppsala University, Master of Laws (LLM), Investment Treaty Arbitration
2014–2017	Tallinn University of Technology, Bachelor of Arts in Law, Law (European Union and International Law), *cum laude*
2009–2012	Tampereen Lyseon Lukio, International Baccalaureate

Language competence

English	Fluent
Finnish	Native
Spanish	Intermediate
Estonian	Intermediate
French	Basic
Swedish	Basic

Professional employment

2023–	NATO Cooperative Cyber Defence Centre of Excellence, Legal Researcher
2020–	Tallinn University of Technology, Early Stage Researcher
2019–	Miller & Company, Lawyer
2018–2019	Gencs Valters Law Firm, Lawyer

Elulookirjeldus

Isikuandmed

Nimi:	Aleksi Oskar Johannes Kajander
Sünniaeg:	03.04.1994
Sünnikoht:	Tampere
Kodakondsus:	Soome

Kontaktandmed

E-post:	aleksi.kajander@taltech.ee

Hariduskäik

2020–2025	Tallinna Tehnikaülikool, PhD
2018–2020	Tallinna Tehnikaülikool, õigusteaduse magistri kraad, õigusteadus (tehnoloogiaõigus), *cum laude*
2017–2018	Uppsala University, Master of Laws (LLM), Investment Treaty Arbitration
2014–2017	Tallinna Tehnikaülikool, sotsiaalteaduse bakalaureuse kraad, õigusteadus(Euroopa Liit ja rahvusvaheline õigus), *cum laude*
2009–2012	Tampereen Lyseon Lukio, International Baccalaureate

Keelteoskus

Inglise keel	kõrgtase
Soome keel	emakeel
Hispaania keel	kesktase
Eesti keel	kesktase
Prantsuse keel	algtase
Rootsi keel	algtase

Teenistuskäik

2023–	NATO CCDCOE, rahvusvahelise õiguse teadur
2020–	Tallinna Tehnikaülikool, nooremteadur
2019–	Miller & Company, jurist
2018–2019	Gencs Valters Law Firm, jurist

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