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# Smart cities and cumulative effects on fundamental rights

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**Abstract:** Smart cities are rarely built smart from scratch. For most cities, “smart city” signifies the presence of several smart city projects that emerge over time from various actors. These projects rely on extensive data and algorithms whose use in urban spaces and/or decision-making processes can impact the enjoyment of fundamental rights in cities. Spatially-grounded and socio-economic rights may be particularly affected. This paper explores the issue of cumulative effects on fundamental rights that may arise from the gradual accumulation of smart city projects in modern cities. It argues that in such a complex landscape of multiple actors, projects and rights, important fundamental rights impacts may be incremental and inconspicuous, and thus, difficult to detect and to stop. It advocates for a fundamental rights-oriented impact assessment process that would enable local authorities to understand and mitigate cumulative effects on fundamental rights. Drawing from the environmental law area and the examples of Cumulative Effects Assessments and Strategic Environmental Assessments therein, it provides concrete recommendations for smart city stakeholders on the essential elements needed for such a process.

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## Introduction

The interest of media, researchers and local communities in smart cities is easily caught by wide-ranging projects promising a real technological overhaul of cities. Entire cities are built smart from scratch, like New Songdo. Existing cities undertake a smart shock with a wide-scale and rapid integration of smart technologies, as in Rio before hosting the 2016 Olympics (Gaffney & Robertson, 2018; Sadowski & Pasquale, 2015). Or, a significant infusion of ICTs in specific city areas, like Toronto's Sidewalks project (Sidewalk Toronto, n.d.). These examples of "canonical smart cities" involve centralised planning and a common network infrastructure to achieve the seamless integration of several smart city services (Greenfield, 2013). Entailing the close involvement of big technology corporations, they have been heavily criticised for being predicated on neoliberalism, and driven by commercial interests (Greenfield, 2013; Halegoua, 2020), creating enclaves for the rich and educated while failing to address poverty and a lack of basic services that persist in many cities (Chatterjee, 2017). There is also the risk of a total digital dependence on (private) technologies for the functioning of essential city services (Goodman & Powles, 2019).

In view of these criticisms, it is arguably fortunate that the predominant model of smart city development is different. What one witnesses in numerous cities is a gradual emergence of different smart city projects, proposed by various actors (e.g. municipalities, inter-municipal organisations, state or local agencies, utility companies, research consortia), usually working together with private companies through public procurement. This piecemeal development is first of all due to the complexity of cities themselves. Smart cities are not legal entities (Ranchordás, 2018). While cities are often associated with municipalities – territorial-administrative divisions with their own government and important competences on local matters – several other entities exercise public functions within municipal borders. A mobility-related smart city project is likely to be proposed by the local public transport company. Electricity distribution network operators may embark on smart public lighting initiatives. Governmental agencies for the environment may leverage ICTs to address air pollution. In addition, in an era of curtailed public budgets, several smart city projects rely on international consortia leveraging op-

opportunities for European and other types of funding presented over the years (Voorwinden, 2022, p. 177). Smart cities develop gradually in an ad hoc manner, “based on what resources are available, what is achievable, and what opportunities arise” (Sadowski & Maalsen, 2020, p. 1).

Voorwinden’s empirical research examining Amsterdam’s development into a smart city well illustrates the highly fragmented emerging landscape (Voorwinden, 2022). The author identified 321 initiatives that concern a wide range of topics and legal fields, and leverage a wide spectrum of technologies. There is no central strategy and pilotage by the municipality. Instead, “Amsterdam Smart City”, a multi-stakeholder organisation comprising the municipality and other strategic smart city partners (van Winden et al., 2016), facilitates communication and provides some form of loose coordination (Voorwinden, 2022, p. 168).

This model of piecemeal development, where different projects emerge alongside one another over time, may be less alarming than the sweeping examples of canonical smart cities mentioned above. Nevertheless, projects still rely on extensive data and algorithms whose use in urban spaces and/or decision-making processes can impact the enjoyment of fundamental rights. When projects process personal data, there is an encroachment on the right to data protection (Autoriteit Persoonsgegevens, 2021). When local authorities or private entities track individuals in city spaces, they interfere with their right to privacy (Galič, 2019). Biased data and algorithms pose risks for discrimination (Cofone, 2019; Zuiderveen Borgeius, 2020). The interface of pervasive digital technologies, urban spaces and local governance that is unique to the smart city context may particularly affect spatially grounded and socio-economic rights. The former denotes rights whose enjoyment is closely linked to the use of public space, such as freedom of assembly and association, freedom of expression, freedom of movement and action in city spaces (Koops & Galič, 2017), which can be compromised by projects tracking or nudging citizens as they go about their daily lives in cities (Galič, 2019). The latter call us to think of local authorities’ important role in realising socio-economic rights by providing public services linked to education, housing, health and other forms of social welfare. The infusion of algorithms and data in public service provision can impact access to public services, thereby affecting a wide array of related rights (Alston, 2019; Niklas & Dencik, 2021; Ranchordás, 2022).

The potential of smart city projects – big or small – to prejudice fundamental rights is well understood and documented. But if one zooms out of specific projects, the overall, long-term effect of the accumulation of smart city projects happening in our cities is difficult to grasp. Piecemeal smart initiatives incrementally,

rather than radically, transform cities (Dowling et al., 2019). And in a complex landscape of multiple actors, projects and rights, important fundamental rights impacts may also be incremental and inconspicuous, and therefore, difficult to detect and to stop. This is the challenge that this research explores.

The paper aims to provide an analysis of the potential cumulative effects on fundamental rights arising as a result of cities' gradual development to the smart model, and of the challenges and opportunities for assessing these effects. Focused on the EU legal framework, the analysis proceeds as follows. First, the paper introduces the concept of "cumulative effects": how they emerged from the environmental context, and how they can be transposed to fundamental rights' impacts in smart cities. Second, it explores Impact Assessments' (IAs) potential as a tool to enable the detection and assessment of cumulative effects. It explains, however, that literature and practice on Human Rights Impact Assessments (HRIAs) and Data Protection Impact Assessments (DPIAs) – the most relevant types of IA for the smart city – human rights context – currently lacks a systematic discussion of cumulative effects. Third, since there is a long history addressing such effects in the environmental context, this paper examines tools used to enable an assessment of cumulative effects on the environment, notably Cumulative Effects Assessments (CEAs) and Strategic Environmental Assessments (SEAs). Lastly, the lessons that could be drawn for smart cities are discussed in.

## **The concept of “cumulative effects”: Beyond and within smart cities**

### **The environmental precedent**

The concept of “cumulative effects” may be quite underexplored in the fundamental rights realm (see section *Data protection impact assessments and human rights impact assessments in smart cities*), but is well established in environmental law and policy. Indeed, the problem of continuous, accumulated interventions is considerably serious in the environmental context: environmental degradation happens gradually and is often the result of multiple actions (Clark, 1994).

The European Environment Agency defines cumulative impacts as “impacts (positive or negative, direct and indirect, long-term and short-term [...]) arising from a range of activities throughout an area or region, where each individual effect may not be significant if taken in isolation” (European Environmental Agency, 1999). The US National Environmental Policy Act adds a temporal dimension referring to “the impact on the environment which results from the incremental impact of the

action when added to other past, present, and reasonably foreseeable future actions” (Council of Environmental Quality, 1997). Environmental scholarship and practice often use the terms “stressor” to describe the actions susceptible to cumulative effects (e.g. the construction of a road); and “valued ecosystem component” to describe the things affected by cumulative effects (e.g. water quality, biodiversity) (International Finance Corporation, 2013; Jones, 2016). The stressors affecting valued ecosystem components can be of the same type, as in the case of several mines operating in an area impacting soil quality. A component may also be affected through a mix of different stressors (mines plus hydroelectric power projects plus irrigation projects) (Noble, 2022). In either case the basic concept is simple to grasp: as stressors increase, so does the likelihood – and possibly also the seriousness – of impacts on valued ecosystem components.

Yet, gaining a good understanding of what these effects actually are is not simple. Several factors complicate the exercise. Cumulative effects are often unintentional, manifest in a piecemeal fashion, and consequently, are difficult to detect (Blakley, 2021). It can be challenging to link cause(s) and effect(s) when they span large periods of time and geographic areas (Jones, 2016, p. 189). Moreover, if an action is deemed small, it may not trigger a regulatory obligation to assess its impacts (such as an Environmental Impact Assessment (EIA)) and escape any scrutiny as impacts are presumed to be minor (Noble, 2022, p. 44). This is despite the fact that even small and seemingly insignificant actions may place additional stress on a valued component and cause negative cumulative effects (Levett-Therivel, 2020). Even more alarmingly, big and/or small accumulated actions could lead to critical “tipping point” situations whereby a valued component that has been experiencing gradual change suddenly reaches a point of major deterioration that is very difficult to reverse (Brook et al., 2013; Dakos et al., 2019). For example, if pollution of a lake with a certain chemical reaches a certain limit, certain fish species may be killed, and this can dramatically change the lake’s entire ecosystem.

The environmental precedent, arguably, already provides useful insights for smart cities. We learn from it that gradual, accumulated actions are likely to have effects that transcend the ones of an individual action, and that such effects are complex and difficult to detect. Cumulative effects inevitably require us to move beyond an action-specific approach. As (Blakley, 2021, p. 4) explains, they “must be analysed in terms of the specific resource, ecosystem, or human community affected, and not from the perspective of the specific action that may cause them”. At the same time, the environmental setting differs from the smart city one, and environmental effects differ from effects on fundamental rights. It is thus pertinent to explore

how and what types of cumulative effects on rights may emerge in smart cities.

## Cumulative effects in the smart city setting

In smart cities, cumulative effects are those caused by the gradual emergence and co-existence of several smart city projects. To borrow from the environmental jargon, such projects are stressors capable of affecting one or more valued components, that is, the fundamental rights city dwellers ought to enjoy. In what follows, the paper takes a closer look at how stressors and valued components can interact in smart cities.

First, the existence of multiple stressors can add to and exert considerable pressure on a valued component. Fundamental rights are of course not absolute: they can be subject to “pressures”. Human rights law permits restrictions for objectives of general interest provided that they are proportionate, that is, as long as a balance is found between the enjoyment of the right at stake and the pursuit of the opposing general interest objectives.<sup>1</sup> This requires a case-by-case assessment that in the context of a smart city project would call for project creators to consider the scope and extent to which one or more rights are compressed on the one hand, the importance of the sought objectives, on the other hand, and balance the two. However, I argue that when pressures on a right add up as a result of several emerging projects, the balance might eventually tilt against the right. Projects considered proportionate in themselves could cause a disproportionate restriction of a right when added together.

In smart cities, the continuous pressure that the right to privacy faces illustrates this point. Let’s think of a municipality that installs smart cameras in busy junctions and squares to count passers-by and detect unusual events. Ensuring the security of residents and visitors is an important objective, and, as safeguards to limit privacy impacts are introduced (e.g. a short data retention period, strong data security measures) the project is considered proportionate. The municipality and other entities then realise that cameras and other types of sensors can provide them with a wealth of potentially useful data and data insights. Installed in parks, they can detect and analyse sports behaviours that take place there: numbers of people exercising, types of exercise, the exercise routes followed, etc.<sup>2</sup> In public transport vehicles and stops they can measure queues, crowdedness and where most people

1. This stems from article 52(1) of the EU Charter of Fundamental Rights, provisions of the European Convention of Human Rights (e.g. articles 8(2) and 10(2)) and fundamental rights case law.
2. The example comes from a smart city project in the Belgian city of Leuven. See: Sport- en bewegedrag in kaart brengen met slimme technologie.



get on/off. The insights gained can inform decisions on the use of infrastructure and facilities, ultimately improving quality of life in the city. They also want to experiment with technologies' potential to nudge people in public spaces to prevent or at least mitigate disturbing behaviours (Galič, 2019, pp. 61-63). To this end, they equip street lights with noise metres which, once they detect high noise levels during night time, trigger responses such as the light dimming, or a message for passers-by to respect residents' sleep.<sup>3</sup> If the nudges work, they can alleviate noise pollution in neighbourhoods long troubled by it. All of the above are lauded objectives, and if the respective projects implement privacy safeguards it could be possible to strike a balance between the conflicting rights and interests.

If the focus shifted from the specific projects towards our valued component, the enjoyment of the right to privacy in that city, that conclusion could be challenged. Privacy is a multidimensional concept (Koops et al., 2017; Solove, 2006). Among other things, it offers seclusion, anonymity and confidentiality (Lever, 2015, p. 168), and enables autonomy by providing "breathing room to engage in the processes of boundary management that enable and constitute self-development" (Cohen, 2013, p. 1906). Especially in the city context, the latter would translate to a freedom to act and express autonomously in public spaces (Galič, 2019, pp. 332-334). The accumulation of smart city projects could compromise anonymity and seclusion. More projects mean more datasets and data streams, which in turn could lead to higher re-identification risks. Individuals could face serious intrusions in their private lives if the vast amounts of data generated by different projects were to be analysed and combined in ways that would reveal detailed insights on their day-to-day activities in the city. Ultimately, the wide-scale tracking and nudging of human behaviour within the city could lead to a chilling effect and profound changes to individuals' relation with public spaces. What if citizens start to fear and refuse to use monitored spaces, or start to behave in a different manner when using such spaces? (Autoriteit Persoonsgegevens, 2021; Clifford, 2019, p. 251). This may seriously compromise privacy as a right meant to protect the freedom to develop one's personality (Clifford, 2019, p. 251).

Second, the affronts to privacy mentioned above also illustrate how the accumulation of projects can cause spillovers, affecting not only the initial valued component (privacy) but spreading to other valued components too. Fundamental rights are often closely intertwined and interdependent (United Nations, 2006). Privacy in particular is deemed to have a strong infrastructural and facilitative role when it

3. The example comes from a smart city project in the Belgian city of Leuven. See: Nachtlawaai verminderen met technologie.



comes to the enjoyment of other rights (Galič, 2019; Koops, 2018) and it is arguably “an indispensable structural feature of liberal democratic political systems” (Cohen, 2013, p. 1905). The obvious corollary to this is that by limiting privacy, the enjoyment of other rights is also likely to be hindered. The chilling effects that may arise due to the ceaseless datafication of public spaces help illustrate this point. Penney’s research shows that chilling effects involve both a deterrent effect (people not engaging in an activity, deterred by fear) and a shaping effect (people acting in ways that conform to perceived social norms) (Penney, 2022, pp. 1454-1455), and indeed both types might be witnessed in smart cities. Rights – our valued components – that could be impacted as a result include the freedom of assembly and association, freedom of expression (Galič, 2019), as well as the rights to movement and tranquillity and to leisure proclaimed in the European Charter for the Safeguarding of Human Rights in the City.

Cumulative effects are not limited to privacy. For instance, the digitalisation and automation of local services and governance causes increasing pressure on non-discrimination and the enjoyment of socio-economic rights for certain parts of the population (Algorithmic Watch, 2019; Ranchordás, 2022; Ranchordás & Scarcella, 2022). The allocation of welfare benefits, the prioritisation of welfare cases and fraud detection can be complex and costly for municipalities, tax authorities and other welfare authorities to make, and algorithmic solutions could expedite and improve the efficiency of such functions (Ranchordás & Scarcella, 2022). A local public employment agency may use software that automatically evaluates an unemployed person’s chances of re-employment on the basis of a statistical model, as this would allow it to identify those with higher employment chances and allocate more resources to them (e.g. by offering training or mentoring). (Algorithmic Watch, 2019, pp. 25–27). Facing an immense workload and sophisticated fraud schemes, authorities entrusted with granting unemployment or childcare benefits may resort to fraud assessment software that would point them to suspicious fraud cases (Ranchordás & Scarcella, 2022). Such algorithmic instruments have been criticised for embedding existing discrimination within their functions, and the potential to inadvertently create links based on bias: a lower socio-economic status, an immigration background, gender and age biases (Ranchordás & Scarcella, 2022; van Bekkum & Zuiderveen Borgesius, 2021). Evidently, each of these projects would raise issues from a fundamental rights point of view that should be considered and mitigated by the respective authority. But the accumulation of similar projects points to an even bigger problem: a systematic disadvantage against vulnerable population groups that might be more difficult to justify on cost and efficiency related grounds.

Having argued that cities' gradual transformation to "smart cities" may cause cumulative effects on fundamental rights, a pertinent question arises as to how such effects could be identified, analysed and mitigated.

## **Assessing (cumulative) effects on fundamental rights through impact assessments**

### **The case for an impact assessment process**

Just like in the environmental context, it can be difficult to detect the emergence and extent of possible cumulative effects in smart cities. Smart city projects span over different periods of time, geographic areas and policy sectors (e.g. energy, mobility, social welfare), making it difficult to pinpoint exact cause-effect links. The impacts of projects' accumulation are uncertain and unpredictable. We need more knowledge to understand how individuals view smart cities as a whole, and the extent to which negative perceptions of the smart city could amount to infringements of certain rights. For example, research in the city of Amsterdam has suggested that citizens perceive the city's datafication with "a feeling of uncertainty and hypervisibility", with hypervisibility being "often spoken about with tinges of fear and sadness" (Jameson et al., 2019, p. 1472). However, we do not know whether they (will) act on those feelings by avoiding use of public spaces or suppressing their behaviour in them, which would constitute a serious violation of privacy. Indeed, when it comes to cumulative effects, it is possible to envisage different scenarios that may or may not materialise.

Courts, our usual human rights protectors, are unlikely to engage in such forecasting. For instance, in a judgement on the legality of the use of facial recognition by the police in a trial project in the UK, when the applicant prompted the judges to consider hypothetical future scenarios that are made possible once the police has access to facial recognition technology, the Court of Appeal held:

[w]e do not accept that, in the present case, it is either necessary or helpful to consider hypothetical scenarios which may arise in the future [...]. Whether other uses of police power in other contexts will be lawful in the future will be a matter to be considered if the facts of such a case arise in practice.<sup>4</sup>

It explained that this approach is consistent with the European Court of Human

4. R v. The Chief Constable of South Wales Police, Court of Appeal (Civil Division) Case No: C1/2019/2670, 11 August 2020, at paragraph 60.

Rights' approach to pay close attention to the particular (current) facts of the case before it.

Instead, the policy tools meant to explore and review risks are Impact Assessments (IAs). IAs enable an entity to examine the effects of a project, programme, policy or piece of legislation. They are legally mandatory or encouraged as best practice in several policy areas where risks play a prominent role, such as the environment (EIA), health (Health Impact Assessment), data protection (Data Protection Impact Assessment - DPIA) and last but not least, human rights (Human Rights Impact Assessment - HRIA). They are mainly ex-ante exercises which, by exploring and reflecting on the impacts of new technologies on affected people before they are adopted, aim to contribute to informed decision-making. While evidently there are differences between the types of IAs mentioned above in terms of their mandatory or optional nature, who the assessor is, the scope and extent of the analysis etc., they generally involve at least the following stages (Kloza et al., 2021, pp. 40-41). First, a screening phase to decide whether the possible impacts would warrant an IA in the first place. If that is the case, the second phase is about scoping and preparation: determining the scope of the assessment, identifying the affected stakeholders, deciding on the method(s) to appraise impacts and on assessment criteria. Third, the assessment phase itself, which consists of a systematic description of the project at stake, an analysis of its impacts based on the chosen method(s), and the provision of recommendations. In principle, stakeholders – especially those affected by the measure and/or their representatives – participate throughout these phases.

IAs can be beneficial in a smart city context characterised by complexity, uncertainty and high risks for fundamental rights' cumulative impact. They force organisations to think of the possible consequences of their proposed initiatives early on, and can thus act as early warning systems allowing project creators to avoid or at least mitigate negative impacts (Friedewald, 2016). When stakeholder participation is ensured, they can be a forum to discuss and address societal concerns, which in turn can improve public trust in the proposed initiatives (Kloza et al., 2021, pp. 34-35). At the same time, even though this paper aims to argue for the potential of an IA for smart cities' cumulative effects, it would be a significant omission not to acknowledge IAs' limitations. An IA is a complex process that entails costs for the assessor, and inevitably, delays in the adoption of the project or policy under scrutiny. Some assessors would opt for a "quick, simple and cheap" process, especially if guidance and oversight on conducting a thorough IA are lacking (Kloza et al., 2021, p. 35). Assessors also face a lack of data or difficulties in ac-

cessing data about the proposed development and the baseline conditions (Chapman, 1981). Even EIAs, which are legally mandatory, and for which there is much experience, were considered to “suffer from an investment of insufficient time, funding, expertise and/or attention to detail” (Wright et al., 2013, p. 75), as well as insufficient quality and analysis (European Commission, 2012).

There are no easy solutions to the above challenges, nor is it this paper’s aim to ponder the problem of IAs’ ineffectiveness. While challenges should be acknowledged, IAs remain a tool with the potential to increase our understanding of the possible impacts of technological progress, and to provide an evidence-based, participatory, process to decide on acceptable and unacceptable risks.

### **Data Protection Impact Assessments and Human Rights Impact Assessments in smart cities**

Among the types of IA referred to above, the most appropriate to examine possible fundamental rights impacts in smart cities are Data Protection Impact Assessments (DPIAs) and Human Rights Impact Assessments (HRIAs). In the following, this paper discusses their benefits and limitations in the smart city context. The most important limitation, it is argued, is that there is seemingly limited experience and knowledge on the assessment of cumulative effects within them. Ultimately, this is what warrants taking a closer look at the environmental context where such assessments are more established.

The General Data Protection Regulation (GDPR) – EU’s overarching law on the protection of personal data – has made DPIAs mandatory for processing operations that are likely to result in a high risk to the rights and freedoms of individuals (article 35). As smart city projects often process personal data, the relevance of data protection law and DPIAs cannot be overstated, especially if one considers that indicators of “high risk”, according to data protection authorities, include the systematic monitoring of publicly accessible areas and automated-decision making with legal or similar significant effects (Article 29 Data Protection Working Party, 2017), which often occur in smart city projects. The fact that they are likely to be legally mandatory in smart city projects is important to stress, since the codification of IAs in the law is believed to create a powerful mandate (Hodgson et al., 2019).

DPIAs’ main focus is the assessment of “risks to the rights and freedoms of individuals”. According to Article 29 Data Protection Working Party, while that formulation mainly concerns (risks to) the rights to data protection and privacy, it may involve other rights such as freedom of speech, prohibition of discrimination and freedom

of movement (2017). Hallinan & Martin argue that it refers to the “complete catalogue of rights and freedoms, outlined in foundational European fundamental rights instruments”, notably the EU Charter and the European Convention on Human Rights (2020, p. 178). Such a broad scope would make it similar to a HRIA, suitable to examine impacts on a wide range of rights engaged in smart cities. However, in practice the DPIA’s scope is less ambitious. Methodologies outlined by (certain) data protection authorities centre on a compliance assessment approach that invites controllers to assess whether the processing complies with a series of GDPR provisions (Hallinan & Martin, 2020). As eventually the focus is mainly on data quality and data security, DPIAs fall short of addressing fundamental rights as the very interests that should be safeguarded through the IA process (Mantelero, 2022, p. 22).

The lack of an obligation to disclose (the full or parts of) DPIAs to the public (Kaminski & Malgieri, 2021; Danish Institute for Human Rights, 2020a, p. 40) and a weak requirement for public consultation (Christofi et al., 2022) are also important drawbacks when it comes to assessing (cumulative) effects on fundamental rights in smart cities through DPIAs. Without information on the risks of existing and planned smart city projects and how they have been assessed, impacts not only remain hidden for the affected persons, but also, it is impossible to conduct a baseline assessment of the current human rights situation in the city. Without the involvement of citizens in the DPIA process, “it seems almost impossible to understand the possible violations of the rights and freedoms of all different individuals” (Autoriteit Persoonsgegevens, 2021), considering that, as argued above, certain impacts of smart cities are closely linked to citizens’ perceptions and fears.

More importantly as far as cumulative effects are concerned, there is no obligation for a cumulative effects assessment within the DPIA exercise. A DPIA is meant to assess the necessity, proportionality and risks created by the envisaged processing operations (article 35(7)). Neither the GDPR nor guidelines of data protection authorities (Article 29 Data Protection Working Party, 2017; Commission de la protection de la vie privée, 2018) explicitly mention a duty to consider interactions with other – existing and future – processing operations and possible cumulative effects.

As for HRIAs, even though states are bound to respect human rights as enshrined in international and national instruments, under European law, only very large platforms must carry out a fundamental rights impact assessment (arts. 34 & 35 Digital Services Act). There is no equivalent obligation for public authorities or private entities other than very large platforms. Of course, this does not prevent

these authorities and other actors (e.g. civil society) from conducting such an assessment. The UN Guiding Principles on Business and Human Rights, for instance, call for enterprises to “undertake ongoing human rights due diligence to identify, prevent, mitigate and account for their human rights impacts” (United Nations, 2011): HRIAs would be an important part of such due diligence. The EU Agency for Fundamental Rights, after emphasising that cities and other local authorities are human rights duty-bearers, invites them to check compliance of their activities, decisions and policies by ex-ante “self-assessing the negative and positive human rights impacts that local measures could generate” (European Union Agency for Fundamental Rights, 2022). Here too, HRIAs would be a suitable tool permitting them to do so.

The benefits of HRIAs for smart cities are manifold. Because they are grounded on the human rights legal framework that includes all categories of rights (civil and political, socio-economic, cultural rights), their very comprehensive scope (The World Bank and Nordic Trust Fund, 2013) allows for addressing impacts on a wide range of rights that might be affected in smart cities. An emerging practice and literature on HRIAs that focuses on digital projects and AI (Council of Europe, 2018; Gerards et al., 2022; Mantelero, 2022; Mantelero & Esposito, 2021; McGregor et al., 2019; Danish Institute for Human Rights, 2020a) provides useful insights for smart city project creators. Among other things, it demonstrates how the impacts of digital projects, products and services may concern far more rights than privacy and personal data protection (Mantelero, 2022). It provides step-by-step guides outlining the assessments’ different phases, including questions to guide assessors (Danish Institute for Human Rights, 2020a, 2020c; Mantelero, 2022; Mantelero & Esposito, 2021) and templates to fill in (Gerards et al., 2022). And it emphasises the importance of public participation to facilitate “a human-centred approach to AI design” (Mantelero, 2022, p. 18), arguing that the perspectives of right-holders on possible impacts, their likelihood and seriousness should be one of the main sources of primary data used in the HRIA (Danish Institute for Human Rights, 2020a).

At the same time, the problem of cumulative effects and their eventual assessment has not yet systematically become part of the discussions on digital HRIAs, and is often not even mentioned. There are two important exceptions that should be mentioned as they support the paper’s argument on the need to assess cumulative effects on fundamental rights. The Danish Institute for Human Rights in its guidance on HRIAs of digital activities explains human rights concerns regarding cumulative impacts and the importance of considering those in the ‘risk analysis’ and

‘prevention and mitigation’ phases (2020a, 2020c). The research of Mantelero and Esposito on HRIAs in the AI context includes a smart city case study in which the author(s) argue that as smart cities encompass various data intensive and AI applications, HRIAs warrant a different approach: one that would consider the “cumulative effect of integrating many layers results in a whole system that is greater and more complicated than the sum of its parts” (Mantelero, 2022, p. 60; Mantelero & Esposito, 2021). For them, such an integrated and large-scale HRIA requires independence (the existence of 3rd party assessors with multi-disciplinary expertise and no relationship to the entities undertaking the projects), transparency over the assessment procedure and its outcome, as well as inclusivity in the engagement of those affected by the smart city projects (Mantelero, 2022, p. 78; Mantelero & Esposito, 2021, p. 31).

## The environmental precedent

Overall, while attention to cumulative effects on the fundamental rights realm has been limited, there is significant experience and knowledge of cumulative effects assessments in the environmental domain from which we can draw parallels and insights for smart cities.

The concept of cumulative effects in environmental law and policy was discussed above (see section *The environmental precedent*). This section looks into the instruments established in the environmental context to identify and assess cumulative effects: Cumulative Effects Assessments (CEAs), which are project-based assessments, and Strategic Environmental Assessments (SEAs) that focus on the impact of programmes and policies, rather than on individual projects.

## Cumulative Effects Assessments

Environmental Impact Assessments (EIAs) – a type of IA meant to enable the identification, evaluation and mitigation of biophysical, social and other effects of a project deemed to have significant effects on the environment (International Association for Impact Assessment, 1999) – are legally mandatory processes with a long history in the EU. Currently, the EIA process is regulated in Directive 2011/92/EU (EIA Directive). This Directive includes an explicit requirement to consider cumulative effects both when deciding whether a project should be subject to an EIA in the first place (annex III, points 1(b) & 3(g)), and when actually undertaking the EIA (annex IV, point 5(e)). EIA reports must include a description of the likely significant effects of the envisaged project on the environment, which result inter alia from “the cumulation of effects with other existing and/or approved projects” (an-



nex IV, point 5(e)). Beyond the EU, cumulative effects requirements are present in the environmental legislation of many countries (Olagunju et al., 2021). CEAs thus emerged as an EIA sub-discipline to add an important dimension to the assessment process: the specific consideration of environmental impacts that would result from interactions with other projects (Cumulative Effects Assessment Practitioners Guide, 1999).

The EIA Directive does not include a definition of cumulative effects, nor does it outline how these should be identified and assessed. The main components of a CEA are, however, explained in international environmental literature and policy guidelines. A CEA first requires assessors to select the valued ecosystem components (VECs) and the spatial and geographical boundaries of the assessment, usually in the scoping phase. VECs are environmental elements deemed to have scientific, ecological, social, cultural or economic importance that could be affected by the proposed project: biodiversity, air, soil, water, land-use, etc (Canadian Nuclear Safety Commission, 2010). Once chosen, they should be at the heart of subsequent analyses. CEAs require a shift of mind-set away from a project-focused approach that focuses on the proposed project, to a VEC-focused approach that puts emphasis on the resilience of the selected VECs and whether they can absorb more stressors (Noble, 2022, p. 45). As VECs are often abstract (e.g. biodiversity, air), assessors should then set the indicators that would allow them to track VEC changes over time and space. Indicator examples could be (levels of) contaminant concentrations in groundwater, noise pollution, wildlife species found in an area, etc. The selection of the spatial and temporal boundaries of the assessment is also important. Usually, cumulative effects call for a regional scale of analysis (J. Blakley et al., 2017). But defining the proper spatial and temporal scale for the assessment can be challenging (Jones, 2016, p. 199): While large-scale CEAs in theory offer more opportunity to detect and consider cumulative effects, if the area covered is large it can be difficult to single out a particular effect as significant. Or, it is possible that the boundaries of the CEA do not align with administrative boundaries (e.g. a municipality or a district), which complicates the allocation of responsibilities during and after the CEA. As for the temporal scale, it has been observed that the larger the time period considered, the less certain the analysis and conclusions about cumulative effects will be (Fleming, 2020). Arguably, being moderate could be beneficial for the CEA, and this may also be worth keeping in mind when it comes to cumulative effects assessments in smart cities.

Once the scale is decided, the CEA requires assessors to identify and list all other developments that could interact with the envisaged project and affect the select-

ed VECs. The list is likely to be lengthy. Therefore, the initial mapping should be followed by an analysis aimed to identify the developments capable of a significant effect on VECs when assessed cumulatively with the envisaged project. For those developments, it would be necessary to gather extensive information to understand cumulative impacts (UK National Infrastructure Planning, 2019). CEAs entail arduous data collection activities. Lack of (access to) available information is considered one of the main difficulties for CEAs (Fleming, 2020, p. 8), however, the rise of big data and open data initiatives could alleviate this problem (Hodgson et al., 2019, p. 2).

For the analysis of impact, assessors must conduct both a retrospective and a prospective analysis (Blakley, 2021, p. 7). The first is necessary in order to “establish the current baseline, assess the historical condition of valued components and characterise trends and changes in conditions over time”. Using the insights gained from the retrospective analysis, a prospective analysis then predicts how VECs may respond to additional stress caused by the project and other projects in the region. According to Hodgson et al., due to improvements in CEA methodologies, assessors nowadays have access to a big toolbox of methods to perform such analyses (2019). Participation of the “public concerned” throughout the EIA is mandatory (Art. 6 EIA Directive). Where an EIA includes a CEA (sub)assessment, public participation should cover aspects of cumulative effects as well.

## **Strategic Environmental Assessments**

Strategic Environmental Assessments (SEAs) are an instrument for the assessment of the environmental impacts of certain plans and policies, regulated in the EU by Directive 2001/42/EC (SEA Directive). They emerged from the realisation that by the time a project is subject to an EIA, crucial questions and factors about its need and desirability may have already been set by policy decisions (Craik, 2019). Indeed, governments define development strategies, plans and programs in fields like agriculture, transport, energy, land use, waste management, or regional development that establish the basis for future decisions on individual projects. When adopting such plans and programs, they would usually consider factors like the existing infrastructure, current demands and access to resources. By requiring certain plans and programs be subject to an SEA, the SEA Directive seeks to ensure that environmental impacts are also among the decision-making factors. This way, the environmental impacts of projects that will eventually need an EIA will be considered as early as possible in the decision-making processes that precede project-based EIAs. Beyond the SEA-EIA relationship, SEAs are also meant “to achieve a deeper and more and more environmentally sustainable approach to public deci-

sion-making writ large” (Fisher, 2017, p. 167).

One of the reasons for the adoption of the SEA Directive was to cater to the fact that the cumulative effects of multiple projects were difficult to consider in project-based EIAs (McGuinn et al., 2019, p. 25). SEAs arguably provide a better mechanism for addressing the potential cumulative effects early on in the decision-making process. Their strategic and holistic nature makes it easier to consider broad, even cross-sectoral, issues (European Commission, 2019, p. 66). The SEA Directive explicitly states that the likely significant effects on the environment that should be considered include “cumulative, synergistic, short, medium and long-term [...] positive and negative effects” (annex I).

The cornerstone of the SEA process is the preparation of an environmental report identifying the proposed plan’s or program’s likely significant effects on the environment, and examining reasonable alternatives (article 5 SEA Directive). The possible environmental impacts are identified and assessed in consultation with relevant public environmental authorities and the public: all are informed and consulted on the proposed plan or program and the environmental report (article 6). The report should include, among other things: a description of the contents, main objectives of the plan or programme and its relationship with other plans or programs; a description of the current state of the environment; which international or national environmental protection objectives are relevant for the plan or program and how these have been considered during their preparation; possible significant effects on the environment and measures to prevent or reduce them; the measures adopted to monitor significant environmental effects once the plan or program is implemented (annex I). The authority adopting the plan or program has to take into account the findings of the report and the input gathered via the undertaken consultations (article 8).

For the assessment of cumulative effects within SEAs, the elements mentioned above with regard to CEAs remain relevant. The focus on VECs, the need to understand the baseline condition (the characteristics and current condition of VECs) in order to predict future changes, the importance of data on VECs and stressors are important principles that underpin SEAs as well (Levett-Therivel, 2020). Two differences between CEAs and SEAs should, however, be noted. First, SEAs are undertaken by public authorities competent to adopt public programmes, plans and policies, and the SEA Directive requires them to consult with other authorities which “by reason of their specific environmental responsibilities, are likely to be concerned by the environmental effects of implementing plans and programmes” (article 6(3)). This can plausibly have a positive effect over the quality of the cumula-

tive effects assessment, as the assessing authority could benefit from expertise and data held by other authorities. Admittedly, insufficient data and expertise among the participating authorities remain a challenge for SEAs (McGuinn et al., 2019, p. 39), but this is likely to be an even bigger challenge for CEAs conducted by (private) project proponents. Second, because of their more strategic, high-level nature, SEAs could accommodate more flexible methodologies, that is, methodologies that are more qualitative and scenario-based. This is an important advantage as detailed data permitting a rigorous assessment may be lacking, and as there can be great uncertainty and speculation concerning certain cumulative effects. To exemplify, Torrieri proposed the use of scenario analysis in SEAs as a tool “to explore the future rather than to foresee it” (2020, p. 35). The development of different scenarios by interdisciplinary teams would give assessors a context to ponder on the question of “[w]hat would happen ... if”, ultimately helping them to envisage positive and negative aspects of the proposed plan or policy (Torrieri, 2020, p. 35).

## **Lessons for smart cities**

From the above analysis on the existence of cumulative effects on fundamental rights in smart cities, the potential of an IA to identify and assess those, and the experience of the environmental context, it is possible to distil the following recommendations for smart cities.

### **Understanding the baseline condition**

The discussion on cumulative effects in the environmental context has demonstrated that the very focus of an assessment of cumulative effects are the valued components that are subject to pressure(s). For any assessment of cumulative effects to be possible, it is necessary to establish the current baseline (Blakley, 2021, p. 7): to understand the state or current condition of the valued components at stake. In smart cities, understanding the state of fundamental rights enjoyment evidently necessitates a good understanding of the technologies present in the city and how they interact with fundamental rights.

Smart cities’ piecemeal development and lack of coordination make it so there is rarely an overview of all smart city projects undertaken in the city that would enable one to understand their impact, individual or cumulative. For as long as such an overview is missing, it is impossible to understand the state of play, that is, the pressures under which a series of fundamental rights might already be subject to in the city. There are glimpses of hope that the problem with the lack of baseline

data is recognised and addressed. The city of Amsterdam adopted legislation requiring all devices collecting data in public spaces to be reported to the municipality (Gemeente Amsterdam, 2021). The resulting sensor register aims to provide transparency over which data is collected in the city and by whom, and this mapping exercise could be the first step to one day enable the examination of cumulative effects. New York is another hopeful example. There, the city council adopted an ordinance on algorithmic accountability which, among other things, established an “Automated Decision Task Force” to discover and document the current state on the use of automated decisions in the city (Algorithmic Watch, 2019, p. 11). All cities with a large number of smart city projects should consider adopting similar initiatives.

### **Publishing the results of undertaken Impact Assessments**

A central register listing the smart city projects that currently run, or will be developed in the city, would certainly be useful. To truly understand the state of play of fundamental rights’ valued components, however, the most valuable information to have is arguably the results of the impact assessment (if any) that were previously undertaken for these individual projects. An IA process usually culminates in the drafting of a report that explains what impacts formed the assessment, and how they have been analysed and mitigated.

With the adoption of the GDPR, DPIAs are likely to be mandatory for several smart city projects. And since the regulation entered into force in 2018, it can be reasonably assumed that a large number of smart city-related DPIAs already exist. Regrettably, contrary to the environmental paradigm where EIA reports need to be published, the GDPR does not include an obligation to publish a DPIA. This was characterised as the biggest shortcoming of the DPIA (Kaminski & Malgieri, 2021, p. 133). But it is a shortcoming that smart city creators can remedy by voluntarily publishing DPIAs, especially considering that most of them are public authorities bound to high standards of transparency. One of the main recommendations the Dutch data protection authority provided in the context of an investigation on the development of smart cities in the country was to “publish as many DPIAs of smart city applications as possible and develop policies on the publication of DPIAs” (Autoriteit Persoonsgegevens, 2021, p. 35).

The weaknesses of DPIAs to provide for an assessment of fundamental rights impacts, not least due to the compliance assessment mind-set promoted by data protection authorities (Hallinan & Martin, 2020, p. 179; Mantelero, 2022, p. 22) have been noted above. Yet, they can still include useful data, especially considering

that for most projects DPIAs are likely to be the only IA undertaken.

## Public participation

Citizens' perceptions of (single) smart city projects and on their city's pathway to smart(ness) are valuable sources of information when it comes to identifying and determining the seriousness of cumulative effects, as alluded above (see section *Cumulative effects in the smart city setting* and section *The case for an impact assessment process*). Any eventual assessment of cumulative effects on fundamental rights in smart cities would thus necessitate some form of public participation. Municipalities and other public authorities have significant knowledge and experience on designing participatory processes for local matters (Organization for Security and Co-operation in Europe, n.d.). They should leverage this knowledge, even if reaching out to departments and colleagues that have worked on participatory processes outside the smart city context means intra-organisational efforts.

Even though the meaningful involvement of citizens in smart city development can be challenging (Christofi et al., 2022), innovative methodologies are being developed specifically with that aim. Researchers at the Free University of Brussels, for instance, organised several “walkshops” in different Belgian cities (Breuer et al., 2022). In these walkshops, researchers and groups of citizens walked together in pre-set routes where a variety of technologies were present. During the walk, the researchers shared information about the smart city projects encountered and sought to gather citizens' responses on the risks, advantages and disadvantages of those technologies, with the intention of ultimately sharing them with smart city administrators.

## Engage in local norm-setting for a cumulative effects assessment in smart cities

In the context of CEAs, it has been argued that the integration of CEAs into legislation – the fact that they became mandatory – led to significant advances for CEAs as it created a strong mandate (Hodgson et al., 2019). A similar mandate may need to be created within smart cities. Municipalities could establish a strategic HRIA for smart cities that considers cumulative effects. They have the power to do so. The analysis of (Voorwinden & Ranchordás, 2021) on the use of soft law within smart cities demonstrates how municipalities have been adopting a wide range of soft law instruments concerning smart cities (e.g. technical standards, ethics charters, guidelines) to advance digital rights, privacy, democracy and participation, among other things. They can even adopt hard law, as the case of Amsterdam's legislated sensor registry demonstrates. The United Nations Human Settlements

Programme (UN-Habitat) has also invited cities to adopt mechanisms that actively integrate their commitment to fundamental rights, such as a repository of human rights impact assessments (UN-Habitat, 2022).

It is not utopian to envisage a framework for a fundamental rights-oriented cumulative effects assessment in smart cities. Several cities are already adopting smart city strategies. Local authorities could make the preparation and adoption of such strategies subject to a systematic, participatory procedure similar to the SEA. The current smart city landscape would have to be described and mapped, and this exercise should yield a good understanding of the state of play of fundamental rights enjoyment in the city. The strategy should then identify relevant fundamental rights objectives and explain how they have been considered during its preparation. The analysis should tackle the possible cumulative effects on valued components and provide for mitigation measures.

One authority would need to assume the central role in the strategic assessment process. This could be the municipality, as the authority vested with broad competences to act in the local interest. The municipality should request input from other public authorities and agencies active in the smart city field, such as authorities responsible for waste collection or transport. Finally, just like SEAs require the consultation of authorities with specific environmental responsibilities in preparing the environmental report, municipalities could consult and seek the expertise of authorities with fundamental rights responsibilities, such as data protection authorities, equality bodies, or even civil society.

## Conclusion

This paper sought to examine the complex issue of possible cumulative effects on fundamental rights as a result of the emergence of multiple smart city initiatives. Because of the number of initiatives, and the different project owners and objectives pursued, these effects are difficult to map and comprehend. Despite such difficulty, it has been argued that cumulative effects on fundamental rights are important to assess because they raise fundamental questions on the enjoyment of fundamental rights within smart cities.

Impact Assessments are suitable tools to cater to the uncertainty, methodological and other challenges surrounding cumulative effects, and their potential should be further explored in smart cities. However, to date there is limited practice of cumulative effects assessment within DPIAs and HRIAs, which are the types of IA most relevant for human rights impacts.



The environmental context can provide a useful precedent as it has more experience, and hence, more knowledge for assessing cumulative effects. Looking into the practice of CEAs and SEAs in environmental law, this paper has extracted concrete recommendations for smart cities.

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